RAILROAD GAZETTE

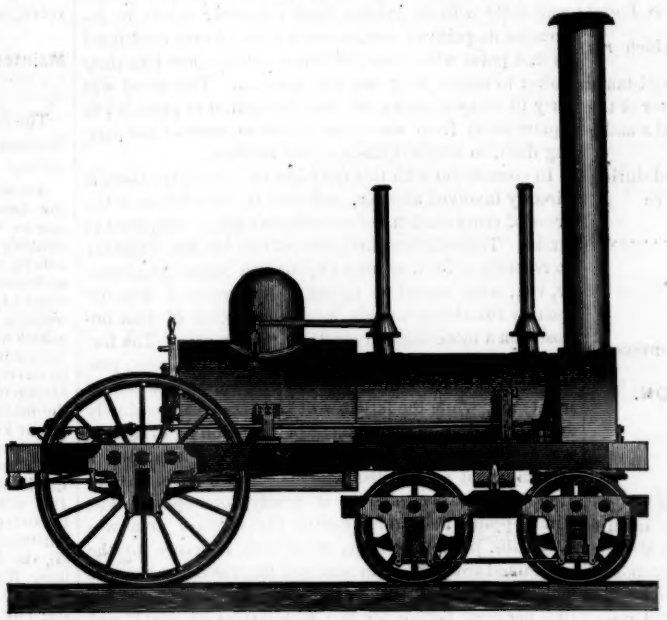
SATURDAY, FEBRUARY 3, 1872.

Contributions.

The First Truck Locomotive.

This engine is the one referred to by Mr. Jervis in his letter of December 13, and published in the GAZETTE of the 23d. It is interesting from the fact of its being the first locomotive to which the truck was applied in the manner in which it is now generally used in this country.

The engraving is made to a scale of ¼ in. — 1ft. and was taken from a drawing furnished us by Mr. Jervis.



Locomotive Engine, with Guiding and Bearing Truck, designed by John B. Jervis, C. E., for the Mohawk & Hudson Railroad in 1831.

NOTES ON THE MANAGEMENT AND DISCIPLINE OF AMERICAN RAILROADS.

BY A HINDOO.

[Continued from page 37.]

A London (England) paper, writing on the "long-hours" question lately raised by Mr. Bass, M. P., reports a conversation between the "special commissioner" and a railway porter, in which the latter is made to say: "It ain't often that I get a holiday, sir, but when I do I spends it in walking around to the other London terminuses and watching how the work is done in them. What strikes me most is the want of any uniform system. The points one line takes most pains with, another neglects, and so on all around. I makes bold for to say, sir, that somebody must be wrong."

The editor goes on to remark, "How many railway directors and railway managers spend their holidays in such fashion as this over-worked porter on 19 shillings a week?"

What appeared strange to this unlettered porter seems no less strange to many railway men of greater pretensions. The want of uniformity is as striking as it is strange. In railway economy there is too much of the "*leges non scriptæ*," too little of the written law. There is no professional literature, excepting, of course, in the engineering and mechanical departments; no authoritative guide to the beginner. However desirous the tyro may be of increasing his professional knowledge, he may seek in vain for books of information. He must accumulate by personal experience sufficient cognoscence to carry him on, with a lively trust in Providence; and amid many different methods, varying from each other not a little, he has to depend upon his "inner consciousness" to decide which is best. It might be supposed that a diligent research among old records containing the decisions and instructions delivered from time to time by the head-office would give valuable and reliable guides to the learner. I have tried it, and do not recommend the plan to anybody. Contradictions are frequent, and often the orders and decisions, having obscure reference to some occurrence of the time, are not clear by themselves or to any one not acquainted with the circumstances that gave rise to them. An old railroad manager, under whom I once had the fortune to serve, was fond of saying, "There is only one way of doing a thing properly, and that is the right way." This being true, the necessity for uniformity is manifest. The best way of doing a thing having been ascertained through experience, that method should always be followed. Considering the ability of railroad officers during late years and in the present time, the dearth of professional literature and of official guides appears unaccountable. Perhaps it is that the men of known ability are overworked, the nature of their multiform duties during long working hours taxing the brain to its maximum limit, so that leisure hours must be times of relaxation, not of study and labor. The railroads have, no doubt, men whose official duties leave them ample time for thought, but these offices are seldom filled by those who have the practical experience of detail necessary to this work, or if they have had the experience they are wanting in zeal for the profession; there is no incentive; or, after having fought the hard fight until the winter of age is on them, they feel entitled to the cozy arm-chair rather than the office stool.

A step in the right direction has been taken by the late St. Louis meetings, in calling together the general managers of Western roads to form an association, having for "its objects the advancement of railroad management and the promotion of railroad interests throughout the West and South." There exists, I believe, a similar association for the East, and also associations of general freight agents and general ticket agents; but beyond the organization of excursions to the Rocky Mountains and the Pacific, with the issue of a printed account bound in dazzling covers, of the trip, its gorgeous palace cars, luxurious hotel on wheels, very amiable and refined lady members, and meetings which voted addresses and compliments to themselves, nothing has come to light. It is to be hoped that the body of general managers who met last month will discuss practical questions of management, and that their discussions will be published in the RAILROAD GAZETTE.

I would suggest, as one of the first subjects that should receive attention at the hands of the general managers of the West, the train-dispatching system. Is the plan now generally obtaining on American roads of controlling the movements of trains from the dispatcher's office, independent of the station masters, a method sufficiently perfect and reliable to insure the maximum amount of safety and regularity of train-service that is possible? My experience of this matter leads me to think that if every manager came to the meeting with a thorough knowledge of the practical effects of the system, and with the moral courage to "own up," a decisive vote of want of confidence would result. Admitting that the arrangement is theoretically good, that it is *prima facie* the cheapest that can be devised, and that it is the least laborious, I affirm that in practice it is unsafe, unreliable; that it is not in the end the cheapest, and that it does not within itself provide any check. I also unhesitatingly affirm that few superintendents know the number of mistakes that are made, the number of hairbreadth escapes, the delays to trains through inattention or want of judgment. It is only when the error has gone on to a result which cannot be concealed that the superintendent hears of it. The position is hardly debatable that "a system providing perfect safety in the working of trains cannot be too expensive." The sums paid in damages and the value of property lost in wrecks, under an inefficient arrangement, would cover the cost of a very elaborate system which prevents such accidents, leaving aside the question whether too great a price can be paid to save one limb, much more a life.

In India butting collisions are unknown. The system there adopted is as perfect a one as can well be devised. The following rules I write from a "Traffic Department Hand-book of Working Orders":

First. No engine, with or without a train, shall be moved from any station unless the engine-man has in his possession a telegram showing that he can proceed to the "next" station, countersigned by the officer in charge of the station he is about to leave. The engine-man must receive this message from no one but the guard of his train. The telegram must be given by the station-master himself to the guard. Before handing it to the engine-man, the guard must satisfy himself that it is correct. It must not be given to the engine-man until the guard has received permission to start.

Second. When the officer in charge of a station has received notice that a train has left the "last" station, he will cause a bell to be rung to warn all the servants of the company. He will then, and not before, apply to the "next" station for a "line clear message."

Third. A "line clear message" is a telegram from one station-master to another, showing either that no train has left the sender's station for the receiver's, or that, if a train has left, the line will be clear upon the arrival of that train at the receiver's station. There are three sorts of messages:

1. *Simple "line clear"*—when no train is on the line.

2. "*Line clear to follow*"—when one train may follow another.

3. "*Line clear on arrival*"—when a "down" train may proceed after arrival of an "up" train, or *vice versa*.

Fourth. When the "line clear message" has been received, the station-master will indorse it, and, if the time be up, will hand it to the guard, authorizing him to proceed.

Fifth. When a "line clear to follow" has been received, the station-master must write across it the time of departure of the preceding train, thus, "Guard and driver of No. — to proceed cautiously. No. — left this at 9:45."

Sixth. When a "line clear" cannot be obtained from the "next" station, the station-master may apply to the second station. If no "line clear" can be obtained, owing to absence of, or interruption to, the telegraphic communication, the guard and driver may, under arrangement with the station-master, and believing the line before them to be clear, proceed cautiously at a rate not exceeding ten miles per hour on a straight line, or five miles per hour in a cutting or curve, repeatedly sounding the whistle.

Seventh. In all messages concerning trains the train must be distinctly described thus, "No. 1 up goods," "No. 2 down passenger," "No. 1 up mixed." For each train there must be a separate "inquiry," etc., and a separate "line clear." Each "inquiry" must mention what sort of "line clear" is required. Thus with two trains, running with a short interval in the same direction, the station-master's "inquiry" for the second train would be, "Is line clear for No. — to follow No. —?" If a train has left the "next" station the "inquiry" would be, "Will line be clear for No. — on arrival of No. —?"

Eighth. As soon as any engine or train has left, the officer in charge of the station shall enter in a book called the "trains departure book," the time the train started and the time the operator was advised, which entry the signaler shall attest. The operator shall then advise the station for which the train has started. The operator receiving the message will immediately enter in a book called the "trains notice book," the time of departure from the "last" station, the time the message was received and the time the notice is given to station-master. On receipt of the notice the station-master will sign in the column provided for the purpose and will enter the time of receiving the notice, and then cause the bell to be rung, etc. —See section 2.

Ninth. No engine or train shall be allowed to leave one station for another until at least ten minutes has elapsed from the departure of the last preceding train. In the case of a passenger train following any other train, twenty minutes must be the least interval allowed.

Tenth. Trains will be started at all stations by the guards only, after permission obtained from the station-master. The starting signal will be a green flag by day and a green light by night, and not in any case by wave of hand or handkerchief.

An attentive perusal of these rules will convince any one who understands the subject that butting-collisions are impossible, and that with common care on the part of the engine-man of a following train tail-collisions should be rare as snow in summer. In case of accident there can be no doubt as to where the blame should rest. The station-master must not give the "line clear message" to the guard until the train has permission to start. Possession, therefore, of the message absolutely clears the guard and engine-man of blame, as in the case of a "clear line," or throws the blame entirely on the engine-man, as in case of a "follow." If the message is a "line clear on arrival," the guard and engine-man are both obliged to know that the train mentioned has actually arrived before they start. As soon as a train has left a station on either side a bell is rung and all about the station warned, so that there is no chance of its being forgotten. From this it can be seen how many checks the system carries within itself, so that an error is corrected as soon as made. This system also affords an excellent means for checking the time kept by trains, and fixing the blame of delay in the proper quarter. In fact, in India trains are run with remarkable regularity. Detention caused by the traffic department is very rare, but the climate is such that delays in the locomotive department cannot be altogether avoided.

The arrangement also aids the locomotive superintendent to check over-speed, as the arrival and departure books show the time made from station to station. However, the important feature of the system is that a perfect fool of a station-master, if such there be by any accident, or a drunken man in charge, cannot endanger the safety of life or property. The most he can do is to delay the trains. No danger can be incurred unless two station-masters and two operators belonging to two stations are all drunk together. The system, it is true, swells the total of the pay-roll, as on a heavily worked road there must be at every station a night station-master and a night operator as well as those by day, and the work of the station people is made heavier; but the safety insured is ample repayment. There is nothing in the arrangement to obstruct the traffic of the road. Possibly equal safety might be obtained and expenditure lessened by making every second station an operating station; giving "line clear" when necessary to pass at the intermediate one. Indeed, under such a system a much heavier traffic can be conducted over a road than on any other method, by placing between every regular station, or between as many as necessary, a blind siding for the passing of trains, making it a rule that trains moving west take the siding and the train bound east remain 800 yards west of the semaphore until the other train has shunted clear of the main line—conductor of the train

taking the siding to manipulate the switch and semaphore.

I may as well here remark that any plan intended to insure accuracy and safety must be faithfully carried out in every detail, or it is practically worthless. In India there is a system of inspection (described heretofore) which keeps station-masters and operators up to their work.

This subject will, let us all hope, receive earnest attention at the meetings of the general managers of the West. Let them snatch the proud honor of being the first to inaugurate a better style of working than has hitherto obtained. Such a course is due to the public, to the shareholders, to the employes and to themselves. Similar meetings have not hitherto, as far as I know, produced any notable fruit. The difficulty, I apprehend, is that railroad heads of departments are unwilling to discuss in public details of management, considering such details as private matters not concerning those out of the department. In fact, railroad management is not yet what it ought to be, what it must be before long—a science.

[TO BE CONTINUED.]

A Problem Solved.

DES MOINES, Iowa, January 15, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The curve described by the pencil, alluded to in your question published in the GAZETTE of the 6th inst., is called a *prolate cycloid*. It may be investigated in a manner analogous to that of the cycloid. Its equation is found to be, $x = r\,a\,\text{vers.in}\frac{-1}{r}y + \sqrt{2rg - y^2}$ (1), in which r a represents the radius of the driving wheel, r the distance from the center of the driving wheel to the center of the crank pin = half the length of the stroke; and x and y co-ordinates to the curve.

If l represents the length of the curve described during one revolution of the driving wheel, we shall have

$$l = 7\int_0^2 \sqrt{1 - \tfrac{2}{14}y} \times \frac{dy}{\sqrt{2y - y^2}} \quad \ldots\ldots\ldots\ldots (2)$$

I find $l = 5.222\pi$.

$\therefore \quad \frac{5280}{5\pi} \times 5.222\pi = 5{,}514.4$ft., the answer.

T. E. HENDRICKS.

PAPERS ON BRIDGE CONSTRUCTION.

NUMBER I.—ON MATERIAL.

In all structures affecting the daily concerns of life, to the strength of which hundreds of human beings intrust their safety, the materials composing them must always be a subject of deep interest. It is, therefore, proposed in this first paper to briefly discuss the qualities of the several materials that enter into those wonderful creations of modern engineering—"iron railroad bridges and viaducts"—those gossamer-like fabrics over which pass millions of human beings daily, and in which the snapping of a single bar might result in a destruction to life fearful to contemplate.

It may appear unnecessary to some to ask a consideration of what may be to them a well-known subject; but there are many who have never given the attention to it that its importance deserves, if, indeed, a great deal of our modern practice is not sufficient apology. There can be no doubt that, as a profession, we do not give the necessary time and consideration to the thorough study of a material that has, beyond all others, contributed to the marvelous development of engineering science. Many engineers are content to leave entirely to the iron master the selection of the grades of iron suitable for the work in hand, and too often give the contractor liberty to purchase as he pleases. Now of all the materials used in the constructive arts, none is so variable or so deceptive as iron, either wrought or cast, or, further, in the form of steel. There is no material more sensitive to variation in treatment, and its grades are as different as the furnaces at which it may be manufactured. It varies with the ore, the blast, the heat, the fuel and the working, in every infinitesimal preponderance of each and every one. Manifold as are the present uses of iron, imagination can hardly bound its future, and especially so in view of the fast-increasing scarceness of timber, with resulting rise of price, and the reasonable expectation of cheaper iron through competition, and the yearly improvements in its mode of manufacture. For the *correct* application of iron to bridge building, a knowledge of its properties is of vital importance, and in no other class of constructions, perhaps, does "a little knowledge" prove to be a more "dangerous thing."

We need not go back beyond thirty years to see what experiment has developed as to the nature of iron, since which time money, brains and labor have literally torn and crushed from it its secrets and laid them open for our guidance in its use. Passing by the early experiments, the Menai and Conway tubes presented an unequaled opportunity for elaborate investigation, and most thoroughly and carefully was it done. These results in a great measure guide our practice at the present day. Coupled with the later investigations of Mr. Kirkaldy and some others, there is little left to be desired to arrive at a faithful knowledge of the *mechanical* properties of iron, and, in a great measure, of its physical peculiarities also.

Wrought Iron.—The value of an iron bar is most commonly judged by its parting limit, usually specified for the best American iron at 60,000 lbs. per square inch. Rarely, even in specifications for some of our most important works, is any other limitation made. It is proved beyond question that the breaking strain does *not* indicate quality, although it was long so supposed, even as late as 1860, at least by a very large proportion of the users and fabricators of iron. Now the truth is that we may have a high parting limit due to high quality and softness, as shown in the best charcoal bars, or we may have a high limit from the iron being hard and unyielding. Yet, measured by the common standard, one would be as good as the other and suitable for indiscriminate use in the same work. There is but one correct way to judge of the relative merits of various iron bars, and but one way to secure beyond question uniformity of material and suitableness for different circumstances under which it may be placed, and that is, to regard the elasticity of a bar conjointly with its parting limit; in other words, to determine its point of permanent *set*, which may be defined as that point where the molecules or fibres *first* lose their power to regain their normal position. This point will vary in various grades of iron (measured in pounds per square inch) from about one-fourth to one-half the parting limit, to which it has no fixed relation.

In connection with this question of elasticity, there is directly involved another, and that is, the relation of the areas of cross-section before and after being subjected to strain. This relation, first pointed out by Mr. Kirkaldy so recently as 1861, at once explains an apparent anomaly, viz., what would be called a low grade of iron frequently sustaining a strain largely in excess of that imposed on a more highly refined and better iron. The former, hard and brittle, liable to snap under a blow, preserved to the last almost its full original cross-sectional resistance; while the latter, soft and fibrous, tears slowly asunder, and, from the moment of its beginning to stretch, was fast losing its sectional resistance. For example, a certain brand of Swedish charcoal iron was reduced in area 70¼ per cent. before it finally tore apart. The strain applied with reference to the original area was 47,534 lbs. per square inch; while with reference to the contracted area the strain was over 160,000 lbs. per square inch. Similarly, a brand of Russian iron contracted but 10$\frac{3}{10}$ per cent. before parting, with strains of 56,447 and 63,883 lbs. per square inch, respectively, for the original and parting areas. Now for bridge purposes, exposed as such structures are to shocks and vibrations, it is important to avoid the extreme of either characteristic. The iron must be neither too hard nor too soft. It must be hard enough to have high recovering power, or elasticity, and must be soft enough to have a good interlocked fibre and freedom from coarseness of texture. It should be neither cold-short from phosphorus nor red-short from sulphur; but if approximating either, it should be the latter, in case ore mixtures will not allow of a neutral quality. It were better to employ an iron having its parting and elastic limit respectively 55,000 and 25,000 pounds than having these limits at 65,000 and 20,000 pounds per square inch respectively. To still further impress the fact that a high parting limit is meaningless in itself, the softer metals, like lead and copper, may be instanced. Put either metal under strain and note how soon it begins to yield, and stretch, perhaps, many times its length before final separation. Its *value* in tension, however, was gone the moment the bar first began to stretch, and under a strain very far inferior to that at breaking. Or a hard metal like steel, on the other hand, will break almost as soon as it begins to stretch, showing that the point of permanent set approaches very closely the parting limit, and the harder the steel the more nearly do these points approximate, until we come to cast metals, when there is an inappreciable difference in sectional area before and after parting. It may not be out of place, in this connection, to say a few words regarding the necessity of a *uniform grade* of iron in the *same structure*. It must be evident on a moment's reflection that otherwise there could not be obtained equivalent strength, for the reason that the whole design is based upon the same unit strain throughout. Using, for example, as a factor of safety five tons per square inch on the tension bars of a trussed girder, unless all those bars were manufactured at the same place, with the same fuel and ores, they would not be proportionately strained: and inasmuch as the strength of such a girder is that of its weakest bar, there results either too much or too little material. It is this fact that removes the construction of iron bridges beyond the facilities of ordinary iron-workers and manufacturers, depending upon the open market for their supplies, and requires for their perfect development the facilities of the rolling mill. Iron bridge building for railway purposes must be conducted in connection with the fabrication of the metal itself, from the ore and fuel in the hillside to the finished bar from the rolls ready for the machine-shop. This is the only unerring way for securing uniformity of product, without which it is difficult for railway officers and others to secure a bridge equally strong throughout all its parts. Where life is involved it is worse than carelessness not to avail ourselves of every possible safeguard, among which that of uniformity in quality of material is not the least.

ALF. P. BOLLER, C. E.

New York, January 7, 1872.

A Problem in Friction.

ENGLEWOOD, New Jersey, Jan. 29, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As it is a general rule in engineering that, with the same weight, the friction on a *small* or *large* surface is the same, will some of your readers—practical railroad men or otherwise—give through your columns the *reason why* a train will not stop as quickly with the wheels set as when a *less* pressure is applied that just allows them to revolve, and oblige HIAWATHA.

Maintenance of Permanent Way by Contract in Germany.

The following is one of a series of interesting papers on German railroads which have been published in *Engineering*:

An important question which has been considered by the Association of German Railway Engineers, and the one to which we intend next to direct attention, is that relating to the advisability of having lines maintained by contract. With reference to this question an inquiry was addressed to the various members of the association as to what experience had been gained concerning the maintenance of permanent way by contract, and it was also asked what system of contracting had been found the best, namely: 1st. Whether it had been found advisable to have the line maintained at a fixed price for a certain distance? or, 2d. Whether it was better to contract for the maintenance of the line at a fixed price for each different kind of work to be done? It was also asked what description of work should be executed by contract?

To these inquiries replies were obtained from the administrations of forty-three railways. The replies of the administrations of: (1), the Breslau-Schweidnitz-Freiburg Railway; (2), the Taunus Railway; (3), the Austrian State Railway; (4), the State Railway of Baden; (5), the Eastern Railway of Bavaria; (6), the Berlin-Hamburg Railway; (7), the Cologne-Minden Railway; (8), the Main-Weser Railway; (9), the Eastern Railway of Prussia; (10), the Thüringian Railway; (11), the Wema Railway; (12), the Emperor Ferdinand's Northern Railway of Austria; (13), the Empress Elizabeth Railway of Austria; (14), the Theiss Railway; and (14*a*), the Berlin-Potsdam-Magdeburg Railway, state that no experience has been gained with reference to the maintenance of the permanent way by contract; all necessary works having up to the present time been executed by regularly employed workmen receiving fixed wages; (15), the administration of the Hessian-Ludwig Railway also states that it is entirely satisfied with the results of paying fixed wages, and does not, therefore, feel inclined to try the contract system for the maintenance of the permanent way; (16), the officers of the Magdeburg-Leipzig Railway state their opinion that the safety of the traffic is best secured by maintaining the permanent way with laborers at fixed wages, and a similar opinion is expressed by the officials of the (17) Nassau Railway, who point out that besides insuring the presence of the staff of men who may be required at any time, there is a great advantage in forming a useful traffic. The administrations of (18) the Altona-Kiel Railway and (19) the railway on the right-hand bank of the Oder pay fixed wages, but allow certain extra remuneration to the men for savings effected in the costs of maintenance of the permanent way. Fixed wages are also paid to the platelayers on the (20) railway of the Palatinate, (21) the Southern Railway of Austria, and (22) the Saarbrück-Trier and Rhein-Nahe Railway. The administrations of these railways, however, institute a comparison between the wages paid within a certain time for maintaining the different parts of the permanent way in various districts, and they are thus able to fix the time required for executing certain works and consequently the cost of the latter. If no exceptional circumstances have to be taken into consideration the men have to perform the work within the stipulated time. Such an arrangement is stated to have given the highest satisfaction especially on the Southern Railway of Austria.

The administration of the (23) Main-Necker Railway has made several trials in letting by contract certain works for repairing the permanent way; but the results obtained have been highly unsatisfactory. The foregoing are the results of the reports of those railways which decline to let by contract the maintenance of their permanent way. There are, however, other lines which report in favor of the contract system, and in these reports we find the following observations and results:

The administration of (24) the Siebenburger Railway

accepts contracts for the maintenance of the way, under the conditions that (1) the bed of the way is consolidated; (2) that the prices for the contracts are based upon experience formerly obtained; (3) that the contractor is a man of proved ability; and (4) that the inspector of the line or district uses his influence in an energetic manner, and receives a certain percentage of the savings effected by the contract system. Under such an arrangement, it is affirmed that only advantages, and never disadvantages, are obtained. If contracts are given out for entirely maintaining a certain length of the line, this distance is seldom fixed at more than two German* miles, and independent tenders are then asked for maintaining this distance during the summer months and the winter months respectively. The permanent way in or near stations also is partly maintained by giving out contracts for the performance of special works, such as: (1) the keeping in a proper and safe state of the lines of rails within the stations for a stipulated price per yard; (2) the maintenance of the points and crossings; (3) the renewal of the sleepers at points and crossings; (4) the maintenance of switches in proper order; and (5) the renewal of different parts of the way.

The administrations of (25) the Berlin-Anhalt Railway; (26) the Magdeburg-Halberstadt Railway; (27) the Upper Silesian Railway; (28) the Saxon State Railway; (29) the Tilsit-Insterburg Railway; (30) the Galzien Charles Ludwig Railway; (31) the Berlin Görlitz Railway, state in their reports that contracts have been given out with advantage for the laying of new rails, or for the entire renewal of the existing lines; also for the renewal of sleepers and keeping open of the drainage; in fact, for all such works as could be distinctly specified. Every one of these railways, however, is opposed to the system of letting the entire maintenance of the way by contract, and very especially to give the contracts to servants of the railway companies, such as station masters or district engineers. Some of these administrations express a most decided doubt whether the way could be kept in a safe and satisfactory condition by paying to the contractor a fixed sum for a certain distance, and they consider that this is especially true of what is properly called permanent way. A similar opinion is expressed by the administration of (32) the Brunswick Railway, and the administration of the (33) railway at Cassel. The latter recommends the contract system for some kinds of distinctly specified work, with four weeks' guarantee.

The administrations of (34) Bavarian State Railway; (35) the Berlin-Stettin Railway; (36) the Lower Silesian Railway; and (37) the Oldenburg State Railway, recommend strongly in their reports the adoption of the contract system for the various works necessary for the maintenance of the way; but none of these reports speak favorably of the system of giving out contracts for the entire maintenance of a certain length of the line. The Bavarian State Railway has tried this latter system, and has found that the only way in which success can be obtained consists, not in letting a contract for a length of, say, about 2 German miles to one contractor, but in trusting the maintenance of a short portion of the line, say about ¼ of a German mile (equal to about 1¼ English miles) to the hands of a small body of laborers, all of whom receive equal portions of their combined earnings, with the exception of the foreman, who gets a premium of from 3 to 5 per cent. The officials of the Bavarian State Railway hope in this manner to give the laborers more interest in their work, and to form also a body of skilled men, to whom, perhaps, at some later period a greater length of the line could be safely intrusted. Of course, in this case, much depends on the ability of the district engineer, who has to examine the works executed, and has to certify for the payments which are made, these payments, however, being made only after the guarantee time of six weeks has passed.

On (38) the Hanoverian State Railway contracts for maintaining certain lengths of the permanent way have been given out for some time, and certain sums varying in amount have been paid per mile for the entire maintenance. Although the state of the line was found to become worse under this system after a certain period, yet stricter regulations and superintendence did much to improve it again, especially after it was made a rule that the contractors should deposit a certain sum of money as guarantee for the proper execution of the work. The great difficulty in this system of contracts consists in fixing the correct price for the maintenance of a certain portion of the line, while it is much more easy to agree about the sum to be paid for a certain class of work only, such as renewing sleepers, etc. Both systems of contract have been adopted by the administration of the Hanoverian State Railways, and according to circumstances the one or the other is adopted for maintaining the way of this railway.

The report of (39) the Wurtemburg Railway expresses a similar opinion, and states further that the contract system, which was formerly adopted for the performance of certain works only, has been extended during two years to the maintenance of certain portions of the permanent way. Up to the date of the report each district engineer was at liberty to keep the line within his district in a proper state by laborers receiving fixed wages, but in a short time the contract system was to be generally adopted. The advantages of the latter are affirmed by this administration to be: 1. Better and more careful work, and independence from the wants of laborers; 2. Better wages for the men, and a saving of about 30 per cent. in the amount paid formerly in weekly wages: and, 3. Better condition of the line, and less frequent repairs on account of the guarantee time of four weeks. In order to obtain, however, these advantages, all the men must have an equal interest in the good performance of their work, and this is chiefly obtained by a uniform distribution of the profits. The Wurtemburg Railway recommends the contract system highly.

A somewhat different opinion is expressed by the administration of (40) the South-North German connecting railway (Sud-Nord Deutsche Verbindungs Bahn). The maintenance of the permanent way of this line is given out by contracts, but a distance of about two German miles is given out to one contractor who has been formerly a foreman plate layer, and who even in his new position is definitively engaged by the railway company. He alone is responsible for the work, and receives the contract sum. This sum is fixed according to the portion of the line, the number of lines of rails, joints, crossings, switches, gradients, material of ballast, the local wages for laborers, and the number and speed of the trains. The contracts are, moreover, divided into two sections—the one includes the keeping in a proper state of the gauge, joints of rails, and the renewal of worn-out sleepers, chairs and rails, the other section refers to all those works which are connected with maintaining the proper state of the road-bed; as, for instance, the filling in of the necessary quantity of fresh ballast, the keeping open of the drains, etc. The contractor is paid every month, and at the beginning of the winter, when the whole line is carefully examined by the chief engineer, the contractor whose district is found to be in the best state receives a premium. After an experience of ten years the chief advantage of this system is found in the economy with which the permanent way is maintained. The selection of careful men and the expectation of profits and remuneration are the best guarantee for a satisfactory performance of the work. The uninterrupted superintendence of the district engineer and the responsibility of the contractor will, it is considered, always improve the state of the line. On the other hand, the disadvantages of the system are the difficulties in fixing a proper price for the contract, and the inability of the contractor to deposit a sum of money as guarantee for the careful performance of his work. The reports of the (41) Westphalian Railway, and, finally, of (42) the William Railway coincide in their opinion with that expressed in the last report noticed.

The Westphalian Railway has for several years entered into contracts for maintaining the line of the district Rheine-Emden; the contract is continually made with one man, for one mile per year. The state of the line is carefully investigated at the beginning and at the end of the year, and only the lowest rate of wages is paid during the time of the contract, and the balance a certain time after the end of the year. The advantages claimed are the same as formerly stated.

The reports of twenty-eight of these railway administrations may be classified in the following manner:

A. Reports which recommend simply the maintenance of the line by laborers receiving fixed weekly wages (15–17).
B. Reports which recommend the introduction of a system according to which the laborers receive premiums or bonus in proportion to the savings effected in the maintenance of the line (18–22).
C. Reports which state that only some well-known classes of work have been given out to contracts. (23–31).
D. Reports which recommend the maintenance of the permanent way by letting the various classes of work connected with it in single contracts (32–39).
E. Reports which state that the entire maintenance of the permanent way is done by contract (40–42).

The conclusion drawn by the Association from the reports referred to above is, that the results of experience show that the entering into contracts for the maintaining of the lines is under certain circumstances and conditions more advantageous than maintaining by laborers receiving fixed weekly wages. These circumstances and conditions are:

1. Well bedded ballast or under structure.
2. No extraordinary constructions of the line, the maintenance of which might be connected with difficulties on account of unforeseen occurrences.
3. Uniform traffic over the line.
4. Confining the contract work to the summer months.
5. Ascertaining the exact amount of work to be done.
6. Exact stipulation of the contract sum.
7. The employment of skilful and trustworthy men.
8. Uniform distribution of the profits among the men.
9. Combined guarantees for the good performance of the work and for the safety of the traffic.
10. Compensation of the district engineers for the increased amount of work in connection with the superintendence of the contract work.

Under these circumstances and conditions the contract system is considered to offer the following advantages:

1. Reduction of costs for maintenance of permanent way.
2. Better performance of the work, and, therefore, a better state of the line, with its desirable consequences as regards the traffic.
3. More rapid execution of the necessary works.
4. Training of skilful laborers.
5. Higher earnings for the men.

But if the above circumstances and conditions exist only partly, the advantages are less, and the following disadvantages may even be the consequences of the adoption of the contract system:

1. Increase of the cost of maintenance of the permanent way.
2. Successive deterioration of the state of the line.
3. Uncertain earnings of the men.
4. Disagreement between superintending engineer and contractor.

Contracts for the entire maintenance of certain lengths of the line are considered to be only preferable to contracts for specified classes of work in the case of lines which require generally an uniform amount of repairing, and over which the amount of traffic is constant. If under those circumstances a strict control is kept over the contractor, this system of contract work may have the advantage of greater cheapness and better maintenance of the line.

Contracts for specified classes of work offer, however, it is considered, greater and better advantages, for the various works may be contracted for according to the special requirements of the case, whence the line can be always kept in its proper state at reduced expenses, which can be stipulated beforehand with better accuracy, while the workmen run less risk, and become more satisfied with their work. The only disadvantage of contracting for the various classes of work necessary for the maintenance of the line is considered to consist in the increased labor of the superintending department.

* German mile—8237.8 yards—4.732 miles English.

Report of the Philadelphia, Wilmington & Baltimore Railroad.

This railroad extends from Philadelphia southwest to Baltimore, 96 miles. It has a branch from Perryville (61 miles from Philadelphia) to Port Deposit, 3¾ miles; and operates under leases the two miles of the Southwark Railroad in the city of Philadelphia, the 5½ miles of the Wilmington & Newcastle Railroad, the 6 miles of the Newcastle & Frenchtown, the 8½ miles of the Delaware Railroad (Wilmington south to Delmar), the 38½ miles of the Eastern Shore Railroad, and the Smyrna Railroad, one mile long, a total leased line of 137½ miles, and a total mileage operated of 237 miles; including nearly all the railroads of Delaware and a section of the leading line from New York to Baltimore, Washington and the South:

The directors of this road submit to the stockholders the following statement of the operations of their road for the year ending October 31, 1871:

From passengers		$1,532,820 03
" freight and express		1,044,760 50
" rents		8,365 90
" mail and miscellaneous		93,018 63
		$2,678,865 06
Newcastle & Frenchtown Railroad:		
From passengers	$25,014 22	
" freight	57,780 60	
" mail	881 24	
		$83,676 06
Total earnings of both roads		$2,762,541 12

The following are the expenditures of the Philadelphia, Wilmington & Baltimore Railroad for the year ending October 31, 1871:

For interest on bonded debt, ground rent, &c., less interest received	$84,800 62	
For operating expenses, including State and local taxes	1,692 598 42	
	$1,777,399 04	
Newcastle & Frenchtown Railroad:		
Operating expenses	$61,920 29	
Tax and bonus to State of Delaware and Newcastle County	11,000 00	
	$72,920 29	
		$1,850,319 33
Total expenditures of both roads		$1,850,319 33
Net earnings for the year		$912,221 79
Dividends of 4 per cent. and United States tax were paid, viz.:		
Due December 31, 1870, from net earnings for six months ending October 31, 1870		$292,334 36
Due July 1, 1871, from net earnings for six months ending April 30, 1871		449,253 33
		$841,587 69
U. S. tax paid under protest		10,322 96
		$851,910 65

The gross receipts were larger than those of 1870 by $117,242.24, and the operating expenses exceeded those of 1870 by $67,333.67. A large portion of the increased business was derived from the transportation of fruit and vegetables from the Delaware Railroad and its feeders. The peaches transported amounted to 2,650,000 baskets, or over five thousand car loads of eight tons each. This shows that this business has more than quadrupled since 1865.

This company encourages the cultivation of the Peninsula, by transporting manures at a slight advance upon cost, and by moving the fruit at high speed, in cars adapted to the business, mounted upon springs and trucks like those of passenger cars, and well ventilated; while charging for the service rates which are very low, considering its character. The result has been a constant and large increase of the area devoted to the growth of peaches, strawberries and other fruits. And notwithstanding that the State of Delaware, by exacting from this company more than thirty times as much tax proportionately as is assessed upon us by the other States into which your road passes, has added largely to the cost of transportion by rail, and consequently to the rates charged therefor, great profits have resulted to the fruit growers, encouraging them to invest more and more capital and labor each year in the cultivation of fruits and vegetables.

It is to be hoped that the next legislature of Delaware, aroused to a sense of the wisdom of a policy which will encourage enterprise and promote the prosperity of the State, will repeal the existing unequal and unjust tax laws, and substitute for them such laws as will divide the State burdens justly upon all interests, instead of throwing them, as at present, mostly upon the patrons of this company.

The work upon the new road of this company between Philadelphia and Chester, called the "Darby Improvement" while under construction, but which when finished will be a part of the main line, has gone steadily on. But the contractors have been somewhat delayed by strikes and the scarcity of labor, and have failed to fulfill their contracts so far as the question of time is concerned. The work, however, has so far advanced as to justify the expectation that it will be ready for use by the 1st of June next.

The value of land upon the new line has more than doubled within the year, and we are encouraged to expect that we shall eventually have a large local traffic upon that part of the road.

In May last, fire was communicated from an adjacent lot to the engine-house and shops at Wilmington, causing the loss of a portion of the buildings, with a large stock of oil, waste and other materials, and serious injury to many locomotives. Insurance covered all but about ten thousand dollars of the loss. All has been renewed or replaced, and the cost thereof, including over five thousand dollars' worth of betterment, was included in the operating expenses of the year. The lot of ground upon which the fire originated has since been purchased by this company, and the buildings will be more secure from fire henceforth.

It will be observed that a large outlay was made during the year for repairs of track. Over thirty-five miles of single track were relaid with steel rails or with steel-head rails. Our experience each year fully justifies the course hitherto pursued, of replacing worn-out iron rails with steel rails, and for two years past all renewals have been made with the best steel rails, excepting upon a few miles of track where the comparative value of steel-head rails is being tested.

Your directors, from personal observation, are enabled to report that all depreciation of any portion of the property of the company has been compensated by the general improvement of other portions, and that the whole property is in a sound and wholesome condition, while the prospect of prosperity in the future is encouraging.

RAILROAD GAZETTE

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A. N. KELLOGG, *Proprietor.*

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Editorial Announcements.

Address.—The RAILROAD GAZETTE *will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.*

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

TRAUTWINE'S ENGINEERS' POCKET-BOOK.*

In the preface of this book the author states that it "has been prepared for *young* members of the profession, and one of the leading objects has been to elucidate in plain English a few important elementary principles, which the *savans* have enveloped in such a haze of mystery as to render pursuit hopeless to any but a confirmed mathematician." In doing this the author has undoubtedly performed a valuable service to a large number of engineers, but at the same time we cannot but think that in doing so he in a measure was obliged to defeat another and perhaps equally important end which a book of this kind should fulfill, that of being portable and—to coin a word—pocketable. The latter can hardly be affirmed of the book under review, as it measures 6¼x4¼x1¼ inches, a size entirely too large and heavy for a pocketbook. The task which this writer has undertaken is in fact quite inconsistent with that of making a pocketbook, and in attempting to do both he has made it less valuable as a compendium of engineering—which it really is—and also as a pocketbook—which it is not. If he had abandoned the idea of making it intelligible to those who have no other mathematical knowledge than an acquaintance with the elements of arithmetic, and had adopted simple algebraic formulæ, the book could have been reduced in size, and much explanatory matter might have been omitted. If, on the other hand, he had not attempted to make it a *pocket*-book, but had made of it an elementary text-book of engineering, its value would have been immensely increased to the class for whom it was specially intended. The evil of compressing the enormous amount of matter which it contains into the space, or rather into one book of this size, becomes apparent after reading it for a short time. The type used is nonpareil and pearl; the first the smallest size used in the advertisements of the RAILROAD GAZETTE, and the latter two sizes smaller. The book is poorly printed, on thin, tinted paper, so that the impression shows through. The result is an indistinctness which makes it painful to read the print for any considerable time. For these reasons we think the usefulness of the book would have been very much enhanced if the author had, instead of making it a pocket-book, made it more of a treatise. There is an abundant amount of matter in it to make several good-sized volumes, as appears from some careful calculations of the amount of matter which it contains. It is, in fact, a remarkable example of the compressibility of printed matter. It has 648 pages and contains two and one-third times as much matter as is in Poor's Railroad Manual for 1871 and 1872, which, as many of our readers know, is a large octavo volume of nearly 600 pages. To take examples which, perhaps, are more familiar to engineers, the pocket-book contains very nearly as much matter as two such volumes as the first one of the new edition of Weisbach—a ponderous book of 1,100 large octavo pages—or more than *sixteen* such books as the "Rudiments of Civil-Engineering," of Weale's well-known series. That the various subjects are not necessarily neglected because the book is small, is shown by the fact that the chapter in this manual on the strength of materials contains as much matter as Professor Wood's large and very useful treatise on this subject recently published by Wiley. So full, in fact, is the treatment of nearly every subject discussed that, as the book now is, it is the most complete American treatise on civil engineering which has yet appeared. The amount of labor which must have been bestowed upon it is almost appalling. The tables are more complete than in any other book that we know of, and the author, in the preface, says that "most of them have been entirely recalculated expressly for this book." One of these—that of natural sines and tangents—covers 45 pages with solid matter. Each page contains 1,871 figures, and there are therefore 84,195 figures in the whole table. There are many other tables besides this, so that it would seem almost as though it would take a lifetime to do the work of recalculation alone.

A mere list of the subjects treated, taken from the table of contents, will give an idea of the ground which the work covers. They are: Mensuration, Plain Trigonometry, Squares, Cubes and Roots, Geometry, Arithmetic, Weights and Measures, Land Surveying, Sines and Tangents, etc., Contour Lines, Dialling, Paper, the Level, the Engineers' Transit, the Theodolite, the Box or Pocket Sextant, the Compass, Leveling by the Barometer, Pendulums, Sound, Strength of Materials, Strength of Iron and Wooden Pillars with full Tables, Trusses for Roofs and Bridges, Trestles, Thermometers, Stonework, Foundations, Cost of Dredging, Retaining Walls, Stone Bridges, Culverts, Arches, Board Measures, Tables of Weights of Bars, Bolts, Pipes, etc., etc., Specific Gravity, Rail Joints, Chairs, etc., Turnouts, Railroads, Table of Level Cuttings, Turntables, Water Stations, Cost of Earthwork, Center of Gravity, Mechanics, Force in Rigid Bodies, Centrifugal Force, Mortar, Bricks, Cement, Concrete, etc., Plastering, Slating, Shingles, Painting, Glass and Glazing, Water, Rain, Snow, Air—Atmosphere, Wind, Evaporation, Filtration and Leakage, Hydrostatics, Hydraulics, Dams, Suspension Bridges, Friction, Traction, Animal Power, Chords to a Radius of 10 for Protracting, Glossary of Terms, Appendix.

Most of these subjects are treated in a very comprehensive way. The chapter on the strength of materials, for example, occupies 69 pages. The one on trusses 65 pages; Foundations, 16 pages; Stone Bridges, 16 pages. The article on force in rigid bodies occupies 52 pages. All the other subjects discussed are very fully treated, and the latest information given about each of them. It is of course impossible in a notice of this kind to do more than make a general description of the contents, as a mere enumeration of the subjects occupies 15 pages in the alphabetical index. Besides this index there is a "glossary of terms," which to unprofessional readers and to young and even experienced engineers will be found very useful.

Altogether the book is the most complete of its kind that has yet been published either in this country or Europe. It is very fully illustrated, not with copies of superannuated cuts which have done service in old works, or are advertisements for manufacturers, but with engravings all new and purchased expressly for this work. Its chief fault is the typography; and all readers, and especially those with weak eyesight, will look forward to the publication of a more legible edition, and we think Mr. Trautwine could hardly do a better service to the engineering profession in this country than by elaborating the plan of this work and making of it an exhaustive treatise on civil engineering. As he has intimated in his preface, such a work is much needed, especially if it were free from abstruse mathematics, with which many practical engineers are not sufficiently well acquainted to be able to read a book of the kind without much difficulty. With respect to this point most engineers will, we think, differ from Mr. Trautwine in the statement that "it is fortunate that few engineers are good mathematicians." It is true that few American engineers especially have had the advantage of a liberal mathematical education, and this fact should constantly be borne in mind by those who write for this class; but it is a misfortune nevertheless, and very much to be regretted. To infer that because "high mathematical talent is rarely combined with that practical tact so essential to a successful engineer," therefore such knowledge as the author "has long since forgotten" is "rubbish," seems to be rather sweeping logic. It is, perhaps, on account of the human nature in us that we are all apt to suppose that any theoretical knowledge of which we are not the masters is not worth knowing.

We can, however, assure our readers that Mr. Trautwine's book contains a great deal of information which we think will be new and we know will be valuable to them. We recommend all civil engineers to buy it, but out of regard for their eyesight to read it in very small installments.

* The Civil Engineers' Pocket-Book; by John C. Trautwine Civil Engineer. Philadelphia: Claxton, Remsen & Haffelfinger, 1872. Price $5.00.

LIGHT ROLLING STOCK.

Engineering of December 29 contains an editorial in reply to our criticism of Mr. Schuyler's letter on the narrow gauge. The chief point of difference between us seems to be stated in the following extract, which we quote from *Engineering:* "What we maintain is, that the small wagons which we advocate as being the best suited for the general traffic of light railways cannot be built for the 4ft. 8½in. gauge with such a small proportion of dead weight as is the case when they are made for gauges of 3ft. or 3ft. 6in. As the wagons become larger so does the advantage possessed in this respect by the narrow gauge diminish, until ultimately, as the increase of size goes on, it is the broader gauge which in its turn has the advantage."

Now, if this statement is true, it still remains for our contemporary to show what the proportion is which the weight of a car should bear to the gauge. We have shown that a car of the same strength and carrying capacity as the one intended for the Denver & Rio Grande 3ft. gauge railroad, could be built for a 4ft. 8½in. gauge and weigh very little, if any, more than the former. *Engineering* says that for a road with a light traffic four-wheeled "wagons weighing from a ton to 25 cwt. empty, and carrying about one and a half times to twice their weight of ordinary goods, will be found amply large enough." Inasmuch as our contemporary recommends the latter car and does not speak approvingly of that intended for the Denver & Rio Grande Railway, we infer that the light four-wheeled "wagon" which he describes and recommends must be the size of car which, it is said, "cannot be built for the 4ft. 8½in. gauge with such a small proportion of dead weight as is the case when they are made for gauges of 3ft. or 3ft. 6in."

It will be remembered by some of our readers, that in the GAZETTE of July, 1871, we illustrated exactly such a car as the writer in *Engineering* describes, and we then showed that the increase in weight due to the gauge was only about *four per cent.* of the weight of the car empty, and * *one per cent.* when loaded. In reply to this our contemporary might repeat the remark contained in the editorial to which we have referred, "that the fact that the weight would be increased by the change, by a certain amount, however small, without any counterbalancing advantage, is itself an argument in favor of the narrow gauge." Our answer to this is, that if the advantage gained is no greater than we have shown, then the difference is not sufficient to justify the introduction of a new gauge with all its attending inconveniences. To use an expression common in the Western States, it seems to be "figuring rather fine" to advocate the introduction of a new system of railroad, because by doing so the gross weight of trains would be reduced somewhat less than one per cent.

In advocating the narrow gauge, those who do so seem somehow to have confused two ideas, one perfectly true, but the other, we cannot help but believe, quite erroneous. They reason that it is folly to carry very heavy rolling stock to and fro to do a light business, and therefore quite naturally turn their attention to reducing its weight. This, they assume, can only be done by narrowing the gauge, when in fact the principle of light roads is applicable to any gauge.

In this connection, too, they often lose sight of the fact that there is some relation between the size of cars and and that of the people who must ride and transport

* The car which we illustrated was said to carry three times its weight of freight, which of course would make the *percentage* of reduction in weight when loaded less than if it carried only one and a half or twice its weight of ordinary goods.

freight in them, and that to a very great extent the dimensions of rolling stock are governed by the ordinary stature of men and women; neither a passenger nor a freight car, for example, can be less than six feet high inside, and the other dimensions must be somewhat proportionate. It is for this reason that the principle stated in *Engineering* is so extremely limited in its application, and this also explains why the narrow-gauge system is so much better adapted to a mineral traffic than to a general freight and passenger business.

Validity of Municipal Bonds in Aid of Railroads.

There have been recently two very important decisions on this important subject. One of these is by the United States Circuit Court at Detroit, rendered by Judges Emmons, Longyear and Withey, which, in effect, passed upon the famous Michigan Supreme Court decision in the Salem case, and declared it of no effect as regards bonds issued before the decision was rendered—that is, it virtually affirms the validity of all the bonds outstanding, for the Michigan decision at once put an end to any further issues.

The United States courts are bound to accept the interpretations of State laws and constitutions made by the supreme courts of the States, each of which is the final interpreter of the laws and constitution of its own State. But in this case the decision of the Michigan court was not on the interpretation of any specific statute, nor on any principle peculiar to the State constitution, but upon a general principle equally applicable to all constitutions and all governments, which, as most State constitutions and the United States constitution especially do, forbid taxation for any but public purposes. The question decided was, What is a public purpose?

On this point Judge Emmons in his opinion says: "When such general principles are asserted by the State courts, as a ground for invalidating contracts, they are adopted or disregarded by the Federal courts as they deem them sound or otherwise, and as justice in the class of cases before them demands."

The effect of this position is indicated by the fourth and fifth rules given in Judge Longyear's opinion, which are as follows:

Fourth. That where a State statute by its terms constitutes in and of itself a contract, on a basis of a contract by the State, or where such statute purposes to authorize or empower any of its municipalities, its public or private corporations or its citizens to enter into contracts, and such contracts have been entered into in good faith, a decision of a State court afterwards made, declaring such statute inoperative and void, or in any manner so construing such statute as to invalidate such contract previously entered into, or in any manner impairing their obligation, is, *prima facie*, in conflict with that provision of the Constitution prohibiting any State from passing any law impairing the obligation of contracts. (Art. I., sec. 10.)

Fifth. That in such cases as last above named, the Federal courts will go behind the State court decision and inquire whether, in the state of the law as practically construed by the legislative, executive and judicial branches of the State Government, and by the bar and the business community at the time the transactions in question took place, such transactions constitute a contract, and, if so, the Federal courts will then enforce such contracts, independently and irrespectively of such State court decision.

This decision, if sustained by the Supreme Court of the United States, will affect not the State of Michigan alone, but every State as well. It is equivalent to declaring in advance that the municipal bonds issued in aid of railroads and similar public works will be enforced by the United States, unless the constitution or laws of the State in which they are issued positively forbid such issues, or unless they are issued after the highest court of such State has declared the issue unconstitutional.

This seems to us very much like deciding in favor of all bonds for such purposes which are issued or may be hereafter. For there certainly will be no such issues where the State laws positively forbid them, or after the State supreme court has declared them unconstitutional. And here arises another question. If the United States courts will enforce the payment of all bonds issued before an unfavorable State decision, when will the State court be able to make such a decision? Who will take a case before the State court when his ultimate failure is certain? Shall the State court say, These bonds are valid, but we decide the law unconstitutional, to take effect in the next case. It seems to us that the decision in the Detroit circuit virtually affirms the validity of all municipal subscriptions not made in contravention of some express or implied provision in the constitution or laws of a State.

Of course States have their remedy—if they want one—by making their laws or constitutions unmistakable in their provisions. This Michigan has already done, as well as Illinois, both of which absolutely forbid any municipal subscriptions to corporations.

So far as the effect of the decision on the outstanding Michigan bonds is concerned, no one should object to it. It will simply compel the payment of debts incurred for a consideration which the municipalities have received—debts which they incurred with the full expectation and intention of paying, and which the Michigan decision has, in effect, absolutely forbidden them to pay. No tax laid for such a purpose was valid, and, of course, no money could be raised in a legal way to meet the obligations. We give elsewhere a statement of the outstanding bonds which will be made good by this decision.

The other decision is by the Supreme Court of Illinois, which affirms the constitutionality of the former law authorizing municipal subscriptions in that State, under which millions of dollars have been voted and hundreds of miles of railroad built. There has been a fear that this law might be pronounced unconstitutional, and this has had a decided effect on the prices of the securities issued under it, 10 per cent. bonds of wealthy towns and counties having been sold not infrequently for 90, or even less.

Railroad Construction in 1871.

In accordance with our request for corrections of statements made in our article of January 13 on Railroad Construction in the United States, we have received several letters, and have otherwise obtained information which enables us to give the following corrections:

In Vermont the *Missisquoi Valley* road was completed to Richford instead of Enosburgh Falls, 28 miles instead of 20. It is operated by the Vermont Central.

In Connecticut the *New Haven, Derby & Ansonia* road, which will form a portion of what is known as the "Parallel road," was completed in August. It is 13 miles long, and extends from New Haven westward to a connection with the Naugatuck Railroad at Ansonia. The proposed "New England & Erie Railroad" will form a western extension of this road to the Hudson, and an extension from Derby northwestward to a connection with the new Shepaug Valley Railroad at or near Hawleyville is proposed. For this information we are indebted to Mr. Charles E. Fowler, the Chief Engineer.

In New York the *Rome & Clinton Railroad* was completed for ten of its 13 miles before the close of the year.

In Alabama the *Savannah & Memphis Railroad* was completed early in the season for 20 miles (Opelika northwest), and at the close of the year 5 miles more of track was down. The *Mobile & Alabama Grand Trunk*, as nearly as we can learn, was completed for 40 miles, instead of 20, north of Mobile.

In Indiana the *Cincinnati, Wabash & Michigan* (which is now the name of the road described in our article as the "Warsaw, Goshen & White Pigeon") extended their road from Warsaw south to Manchester, 20 miles.

In Michigan most of the track was laid on the *Northern Central* from Jonesville north to Albion, 20 miles.

In Illinois the track was laid on the southwestern terminus of the *Chicago, Pekin & Southwestern* from Pekin eastward to Groveland, six miles.

In Iowa the extension of the *Sabula, Ackley & Dakota* (according to the Governor's message) was 17 miles further than we reported, to Oxford Mills, Jones County.

The *Burlington & Missouri River* had a branch completed from Chariton southwest to Garden Grove, 22 miles.

In Wisconsin the *North Wisconsin* Railroad had the track laid at the close of the year from Hudson northward to Richmond, 20 miles.

Track was laid on the *Appleton & New London* from Manitowoc westward 23 miles, in the direction of Appleton.

In Texas, on the *Houston & Texas Central*, the section of the Western Division, completed during the year, from Burton to Austin, is 80 miles long instead of 22, as we reported.

In Oregon the *Oregon Central* was completed for 20 miles.

On the other hand in Ohio five miles of the *Newark, Somerset & Straitsville* road, reported completed, remained to be laid with track, and the *Lake Shore & Tuscarawas Valley* road was completed, not from Cleveland to Seville, but from Grafton to Sevil e, 25 miles instead of 42. In Missouri the *Lexington & St. Louis* had not more than 40 miles of track laid, instead of 55. In Wisconsin ten miles or more of the *Milwaukee & Northern* remain to be completed before reaching Plymouth.

So far, we find that a length of line of 286 miles not reported in our article of January 13 was constructed in 1871, and it reported 47 miles of lines which at that time were not completed. This would give an aggregate of 7,222 miles of railroad completed in the United States in 1871.

A Grand Trunk Scheme.

"The marriage of a beautiful and wealthy heiress with a debauched and insolvent old spendthrift would be very fairly represented by a financial partnership between the Montreal Steamship Company and the Grand Trunk Railway," says the Toronto *Globe*, which does not like the Grand Trunk Railway—or rather very much dislikes its managers. It insinuates that Mr. Price, Chairman of the Midland Railway Company of England, and his brother-in-law, Mr. Potter, Chairman of the Grand Trunk, and both largely interested in the Barrow Iron Works and the port of Peel, are scheming to have their companies purchase the Allan line, and run the steamers between Montreal and Peel, thus insuring all their traffic to the Midland, which alone reaches Peel, and building up that port to the great advantage of the brothers-in-law and others who own land there, even if their companies should happen to lose something by avoiding Liverpool.

But the negotiations for the purchase of the Allan steamers having failed, we shall probably never know how far the *Globe's* story is true, and how far it is—to speak euphemistically—"imaginative."

Earnings of Minnesota Railroads.

The State of Minnesota last year had for the first time a Railroad Commissioner, among whose duties is the collection of statistics of the railroads of the State. In his first annual report, recently published, is the following statement by the companies of their mileage, earnings, cost, etc., for the year ending September 30, 1871:

Name of Railroad.	Miles of road	Gross earnings	Earnings per mile	Earnings per mile run	Cost of road per mile
Milwaukee & St. Paul	137	$1,319,416	$7,441	$2 47	$38 620
St. Paul & Pac Branch Line	76	285 397	3.755	1 85	58.731
St. Paul & Pac. M in Line	135	319,931	2.370	2 08	67,871
Winona & St. Peter	142	464, 98	3,273	1 88	35.750
St. Paul & Sioux City	122	3<8,829	3.168	1 88	34.426
Lake Superior & Miss	156	429,225	2,751	1 34	49.744
Southern Minnesota	170	450,439	2,650	1 62	55,400

These returns would indicate that the Minnesota companies are not getting rich very fast. In no case do the gross earnings amount to more than 19½ per cent. of the reported cost (on the Milwaukee & St. Paul), while the main line of the St. Paul & Pacific shows gross earnings not quite equal to 8½ per cent. of the cost reported. This reported cost, however, is extravagant, considering the condition of the road and its structures and stations and the amount of its rolling stock; moreover, a large part of its business had hardly commenced. The earnings largest in proportion to cost next to the Milwaukee & St. Paul were those of the Winona & St. Peter, 9.15 per cent.; and the St. Paul & Sioux City, 9.19 per cent. The Lake Superior & Mississippi, counted one of the most promising lines, received 5½ per cent. of its cost; but this again was a new line whose traffic was but just begun. The Southern Minnesota—a very well placed line through a fertile country—received a trifle less than 5 per cent.

This certainly does not appear encouraging to investments in new railroads in Minnesota; but there are two things to be borne in mind: one of these is that the capital account usually reported as "cost of road" in some cases must be twice as great as the actual cost in money of construction and equipment; and another is that the country is comparatively new, very fertile, growing satisfactorily, and that in time many of these lines, if too many new roads are not constructed in their territory, may very reasonably expect to earn $10,000 per mile, or more.

Besides most of these railroads have an important source of income aside from their traffic in the valuable land grants which they own, or at least received as an inducement for construction.

A Grand Ducal Time Card.

We have received a copy of the special time card for the train which conveyed the Grand Duke Alexis and suite over the St. Louis, Kansas City & Northern Railway from St. Louis to Kansas City on the 11th inst. It is a lithographed sheet in an ornamented envelope, bearing a general resemblance to a dinner or wedding invitation, and is thereby likely to raise false hopes in the recipient. The envelope has a broad gilt border, gilt lettering, and a lithograph of the Russian double-headed eagle, which on this occasion may be supposed to have faced St. Louis and Kansas City impartially, offering to one the world and all the glory thereof, and to the other the scepter of dominion, but which to which we would by no means intimate, leaving that question to be settled by the respective cities.

The title page of the sheet inclosed in the envelope is headed by this same ambiguous (and generous) fowl, this time in gilt, with a Russian flag on the left and the stars and stripes on the right. An engraved title of elaborate design, also in gilt, covers the lower half of the page. The time card is lithographed in black on the

third page, with a broad gilt border, headed by a monogram of the company's title in gilt. By it we learn that H. I. H. the G. D. A. of R. was to be carried from Biddle street, St. Louis, to Kansas City, 275 miles, between 12 o'clock noon and 12 o'clock midnight, or else 12 o'clock midnight and 12 o'clock noon, the time card not being disfigured by the abbreviations "A. M." and "P. M.," —perhaps in accordance with Russian custom.

The Railroads and the Mails.

Very few of the railroads of this country which are fully in operation do not carry mails, and therefore the mileage of railroad mail route is an entirely trustworthy, if not a complete, index to the railroad mileage of the country. The report of the Postmaster-General for the fiscal year ending June 30, 1871, gives the length of the railroad mail routes at that time as 49,834 miles, which is considerably less than other reports of mileage at that time would indicate. On these routes mails were carried an aggregate of 55,557,048 miles—something more than half the distance between the earth and the sun. The cost of this transportation was $5,724,979, or about 10.30 cents per mile. This was a very little less than the cost per mile for transporting mails other than by rail or steamboat; but it should be remembered that the mails by the latter routes are many times larger than the others, in many cases requiring an entire car, while a pair of saddle-bags are often sufficient for the routes by common roads.

The steamboat routes, it may surprise many to learn, were two-fifths as long as the rail routes, being 20,334 miles long; but this includes, we suppose, the various ocean routes to foreign countries. By these mails were carried 4,684,778 miles at a cost of 16.58 cents per mile.

The increase in railroad routes during the year reported amounted to 6,107 miles, during the previous year to 4,190 miles; and during the year ending June 30, 1868, to 3,519 miles.

British Railroad Progress.

In 1870 280 miles of new railroad were opened in the United Kingdom. *Herapath's Journal* says that the increase in 1871 was much less, and gives a list of the more important, varying from one to 17 miles in length, the aggregate of which is about 100 miles. This is in striking contrast with the 7,000 miles opened in the United States during the same period; but the fact is, Great Britain—England at least—has rather an over-supply of railroads, the average percentage of profit on the capital expended being reported at 4.52 per cent. for the year 1871, when it was greater than for any previous year since 1847. And this very moderate income is not caused by excessively low rates, the cost of transportation on these railroads being usually greater than in this country. The average receipts per mile in 1871 were greater than ever before, being $15,390 gold (counting five dollars to the pound), which is probably nearly or quite twice as great as the gross receipts per mile of American railroads; but the average cost per mile of the British roads is about $170,000; while the average capital account (it can hardly be called cost) per mile of our railroads is probably less than $50,000.

The total mileage of the United Kingdom at the present day is given as 14,700 miles—about one-fourth that of the United States. The total capital represented by this property is $2,602,000,000—which may be remembered easily as being about equal to our national debt.

Train Dispatching.

In his "Notes on the Management of American Railroad's' in this number of the RAILROAD GAZETTE, a contributor criticises severely the train-dispatching system now almost universal on Western railroads and fast being introduced upon Eastern lines, and almost universally considered by American railroad managers a very great improvement on the practice which it has supplanted, and, indeed, one of the most valuable improvements in railroad operation since the introduction of locomotives.

It would serve an excellent purpose if managers and others familiar with this system would give us the results of their experience.

Florida and its Railroads.

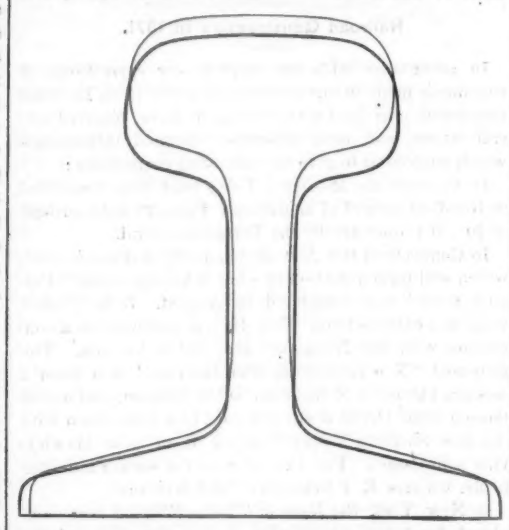
The Governor of Florida in his recent message says that the State has given for its two leading railroads a million acres of land estimated at $1,250,000 (one of these roads a few years ago was offering to give away its lands so received to any one who would settle on them); the proceeds of lands sold between 1850 and 1868 amounted to $750,000; accumulated interest and indebtedness, probably $1,000,000; besides bonds given by counties, amounting to $500,000. This is a total of $3,500,000.

Contributions.

Light Rail Sections.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the GAZETTE of January 27th Mr. C. P. Sandberg has published a letter comparing his standard light rail sections with those I have designed for Messrs. Heyerdahl, Schönberg & Co. *Engineering* has also published an editorial of similar purport to Mr. Sandberg's letter. Quite naturally, they both seem to regard the question from the manufacturer's point of view, whereas the parties here who buy rails are most interested in their quality, or wearing capacity. From the sketch which represents an outline of the sections of 30-lb.



rail (the light outline is Mr. Sandberg's and the heavy one mine), it will be seen that the difference between the two is not very great, and is chiefly due to the height and width of base. It is quite true that the vertical stiffness is increased very nearly as the square of the height, but it is quite as important that the base should have sufficient bearing on the cross ties as that the rail should have vertical rigidity.

In order to increase the height of his rail and maintain the angle of 15 degrees for the head and base, Mr. Sandberg found it necessary to reduce the size of the head, and at the same time narrow the base. There is, therefore, less material in the head for wear, and a narrower base, so that the liability of the latter cutting into the cross ties is very much increased, while at the same time the angle of the base gives more material in that part of his section than is contained in that of my design, which is wider.

There is also another feature about the reduced angle referred to above which is worth consideration. It is quite true that a rail with a narrow base, whose angle is more obtuse, is easier rolled than a narrower one, the top of which slopes at a more acute inclination. Therefore it is necessary in making rails of the latter pattern, to use better material in order to fill the rolls, and to that extent are the sections designed for Messrs. Heyerdahl, Schönberg & Co. a protection to the consumer of rails, in obliging the manufacturer to use good iron.

With reference to the difficulty of manufacture, the firm referred to assure me they will have no difficulty in filling orders for rails of this pattern at the same prices as those of Mr. Sandberg's.

It is, of course, to be regretted that there should be two patterns so much alike, but inasmuch as those for Messrs. Heyerdahl, Schönberg & Co. were designed without the knowledge of, and in fact before, those of Mr. Sandberg, and the two are now before the public, their value must be determined by their respective merits, to decide which we know of no more competent body than the Iron and Steel Institute of England.

In conclusion, let me add that had Mr. Sandberg's light sections been made public before I was called upon to make such designs, I should have hesitated before departing from his practice, knowing that he has made rail sections a special study, and devoted much time and thought to the development of the best form. Having, however, reached conclusions independently of him, which differ somewhat from his, I feel called upon to defend them until convinced of their error.

M. N. FORNEY.

Railroad Entrances into Chicago.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Often the fear of trespassing too much on the space of a valuable journal debars the writer of a letter from explaining his subject and the object he has in view thoroughly. I am led to believe by your comments on my letter on the above subject in your issue of the 20th inst. that you do not fully understand the object of my plan. I am well aware of the reason why the property along the route of the Chicago & Alton Railroad is rather increased in value than otherwise. The principal cause is the nature of the business carried on in the district through which it passes. If that district was better adapted for residences and so occupied, the effect on the value of the real estate would be the reverse. The true object of my plan is to not only afford an ample and convenient track-way for all new railroads that seek an entrance to the city, but also a shorter and more convenient route for many of the old roads that now pass through very valuable districts of the city, adapted and occupied for residences only. Take, for instance, the Columbus, Chicago & Indiana Central Railroad. In order to get to the very point on the river to which my track-way would bring it, it makes a curve of six or eight miles around the suburbs of the city, passing over a district that will soon be very valuable as residence property on account of the location of the parks. Take also the Chicago, Burlington & Quincy Railroad, that crosses the south branch of the Chicago River near Sixteenth street, and passes through a very valuable portion of the South Division of the city in order to reach its depots on the Lake Shore. Would not both of these railroads be benefited by taking a much shorter route to reach a desirable location for their depots? Also take into consideration the great privilege which they would possess in common with the other railroads on the same track-way, and which is so desirable to railroads, a river front of over four miles. All railroad men know the value of short and uninterrupted railroad entrances into cities. Perhaps the Northwestern Railway would be put to some considerable expense in removing its tracks from Kinzie street, but would it not also be fully compensated for it by having so large a number of railroads with their depots brought, as it were, to its door, so that they would have full and easy connection? All railroad tracks placed on the original level of the city are on a level with the lumber yards, coal yards, warehouses and factories. It is only the streets that are raised to the established grade. As it is impossible for every merchant to have a railroad to his storehouse, the best that can be done is to place the depots as near as possible to the business center of the city. I think the ground mentioned in my letter is as near that center as can be.

JOHN HARDEN.

General Railroad News.

PERSONAL.

—Mr. Erastus Hopkins, for some years a Presbyterian clergyman, and President of the Connecticut River Railroad Company during the period of its construction, died recently at Northampton, Mass.

—George R. Dennis, the new United States Senator from Maryland, is President of the Eastern Shore Railroad Company.

TRAFFIC AND EARNINGS.

—In 1871 St. Louis received 857,642 tons of freight from and shipped 635,571 tons by the railroads west of the Mississippi, and received 1,121,028 tons from and shipped 510,392 tons by the roads east of the river. This gives total rail receipts of 1,978,660 tons, and shipments of 1,145,963 tons. About 12½ per cent. of the receipts from the West were by the North Missouri, 34 per cent. by the Iron Mountain, 31½ per cent. from the Missouri Pacific, and 22½ per cent. from the Atlantic & Pacific. From the East, 27⅞ per cent. of the receipts were from the Ohio & Mississippi, 19½ per cent. from the Chicago & Alton, 10½ from the Vandalia road, 10 per cent. from Indianapolis & St. Louis, 7½ per cent. by the Toledo, Wabash & Western, 5 per cent. from the Rockford, Rock Island & St. Louis, 10 per cent. from a coal road, and smaller amounts from other lines.

—A correspondent of the New York *Times* gives the following account of live stock receipts and shipments at Buffalo during 1871:

"In 1871, the receipts at the yards over the Lake Shore, Michigan & Southern Railroad were 290,000 head of cattle, 331,000 sheep, 834,000 hogs and 12,300 horses. The Grand Trunk brought 20,000 cattle, 110,000 sheep, 3,000 hogs and 800 horses; the Suspension Bridge & Erie Junction, 68,000 cattle, 97,000 sheep, 47,000 hogs and 300 horses; the New York Central, 2,000 cattle, 2,500 sheep, 300 hogs and 100 horses; a total of 380,000 head of cattle, 540,500 sheep, 884,300 hogs and 13,500 horses. In the same year the shipments over the New York Central Railroad were 244,000 cattle, 340,000 sheep, 470,000 hogs and 8,500 horses. The shipments over the Erie road were 113,000 cattle, 140,000 sheep, 300,000 hogs and 2,500 horses; a total of 337,000 head of cattle, 480,000 sheep, 770,000 hogs and 11,000 horses. The receipts at the yards for 1871 comprised 1,828,300 of all kinds of stock."

—The 229,639 immigrants who arrived in New York during the year 1871, most of whom went westward by

rail, would have filled 4,600 cars, and supplied passengers sufficient for three fair trains daily.

—The grain trade of Baltimore increased greatly last year. The city exported about 2,000,000 bushels of corn to foreign ports, and about the same quantity to ports on the coast (chiefly in the South); and about 2,000,000 bushels of wheat, equally divided between foreign and United States ports.

—The reports of the live-stock market business at Kansas City in 1871 show that the number of cattle received by the different roads was as follows:

Kansas Pacific	84,597
Leavenworth, Lawrence & Galveston	9,540
Missouri River, Fort Scott & Gulf	20,325

Also 194 by the Hannibal & St. Joseph, 281 by the Missouri Pacific, 222 by the North Missouri, and 5,667 driven into the city. The shipments were:

Hannibal & St. Joseph	419,278
North Missouri	26,308
Missouri Pacific	22,905
Other railroads	1,913

During the year 45,543 cattle were packed in the city.

—The following reports of earnings are made for the second week of January:

	1872.	1871.	Increase.	Per cent. of increase
St. Louis & Iron Mountain	$44.532	$34.487	$10,045	29
Pacific of Missouri	59,384	53,929	5,455	10

And for the third week of January:

	1872.	1871.	Increase.	Per cent. of increase.
Milwaukee & St. Paul	$104.746	$80.090	$24.654	30¾
Toledo, Wabash & Western	111,382	80,866	30.516	37¾
Lake Shore & Mich. Southern	294,954	242,835	52,119	21½

ELECTIONS AND APPOINTMENTS.

—An election of the stockholders of the Penoka & St. Croix Railroad Company was held Dec. 28, and the Hon. H. D. Barron was elected President; Hon. S. S. Vaughn, Vice-President; Hon. Asaph Whittelsey, Secretary, and Geo. R. Stuntz, Treasurer. Penoka is a point on Lake Superior near Bayfield, and this is one of the companies organized in view of the extension of the St. Croix land grant, expecting to receive the Bayfield division of the grant.

—Mr. W. T. Slater, late Assistant Superintendent of the Indianapolis, Bloomington & Western Railway, has been appointed Superintendent of the new Champaign, Monticello & Decatur Railroad, with headquarters at Champaign.

—Mr. S. R. Stimson has been appointed Superintendent of the West Wisconsin Railway in place of J. B. G. Roberts, who remains as Chief Engineer of the road.

—The following were chosen directors of the Philadelphia, Wilmington & Baltimore Railroad Company at the recent annual meeting: Isaac Hinckley, Samuel M. Felton, Wm. Sellers, Samuel Welsh, Philadelphia; Jesse Lane, Joseph Bringhurst, Samuel Harlan, Jr., Wilmington; Thomas Kelso, Enoch Pratt, Thomas Donaldson, Thomas Whitridge, Samuel M. Shoemaker, Baltimore; Jacob Tome, Port Deposit, Md.; Nathaniel Thayer, William Minot, Jr., Boston; all re-elected. Isaac Hinckley was re-elected President, Enoch Pratt, Vice-President, and Alfred Horner, Secretary and Treasurer.

—At the annual meeting of the Lehigh Valley Railroad Company on the 8th ult. the following were chosen directors: Charles Hartshorne, William W. Longstreth, J. Gillingham Fell, John Taylor Johnson, Wm. H. Gatzmer, David Thomas, Ashbel Welch, Edw. H. Trotter, Ario Pardee, William L. Conyngham, Edward Roberts, William A. Ingham. Asa Packer, President. All these are re-elections.

—The Montreal Rolling Mill Company has elected officers for the ensuing year as follows: President, P. Redpath; Vice-President, C. A. Watson; Directors—P. Redpath, E. Ryking, C. S. Watson, G. Stephens and J. Rose.

—The annual meeting of the Granite Railway Company (the oldest in America) was held on the 23d ultimo, at the office in Boston, when the following list of officers was re-elected for the ensuing year: President, John S. Tyler; Vice-President, John C. Pratt; Directors—Benjamin Bradley, John Felt Osgood, William B. Sewall, John D. Parker, George Lewis: Treasurer and Clerk, George Lewis; Agent, Oliver E. Sheldon.

—The annual meeting of the stockholders of the Shepaug Valley Railroad Company was held in Litchfield, Conn.: Messrs. Edwin McNeill, J. D. Perkins, H. W. Buel, H. R. Coit, G. M. Woodruff, E. W. Seymour, G. A. Hickox, J. B. Hand, William Deming, S. H. Mitchell, G. C. Hitchcock, S. S. Logan and O. L. Hodge were re-elected Directors. At a subsequent meeting of the Directors, J. D. Perkins was re-elected President, H. R. Coit Treasurer, and G. M. Woodruff Secretary.

—Mr. A. E. Smith, for some years in the service of the Merchants' Dispatch, has been appointed Assistant General Freight Agent of the Michigan Central Railroad, with headquarters in Detroit. He will have special charge of the Michigan business of the road.

—H. Alexander, Jr., has been chosen President of the Springfield & Farmington Railroad Company, in place of A. D. Briggs, who has been made one of the State Railroad Commissioners.

—George H. French has been chosen President, M. A. Barnes, Vice-President, and W. H. Price, Secretary, of the Davenport & St. Paul Railroad Company. Mr. French succeeds Hiram Price; the others were re-elected.

—E. K. Hyndman, late Superintendent of the Lehigh & Susquehanna Railroad, has been appointed General Superintendent of the Pittsburgh & Connellsville Railroad, with headquarters in Pittsburgh.

—Under date of January 19, B. E. Smith, President of the Indianapolis, Bloomington & Western Railway Company, issued the following: "Charles W. Smith has been appointed General Manager of the Indianapolis, Bloomington & Western Railway, from and after the 1st of February proximo; and is charged with the duty of general supervision of the operations of the road, and all the departments of this company. All heads of departments will obey his orders and report to him under his direction."

—The Columbus & Ferrara Railroad Company on the 11th ult. chose the following directors: Messrs. Henry Miller, R. C. Hoffman, Wm. Moneypenny, Z. Vesey, Thomas Miller, E. T. Mithoff and A. C. Doney. The following officers have been elected: E. T. Mithoff, President; Henry Miller, Vice-President; Mr. Hanes, Treasurer; E. T. Mithoff, Henry Miller, R. C. Hoffman and Thomas Miller, Executive Committee.

—The Northern Line Packet Company held its annual election in St. Louis on the 18th ult. and chose the following directors: T. B. Rhodes, T. H. Griffith, R. C. Gray, J. B. Rhodes, T. C. Buford, D. Hawkins and Adam Jacobs. The newly elected directors appointed the following general officers for the year: Thomas B. Rhodes, President; Thomas H. Griffith, Secretary; Thomas J. Buford, Superintendent, and Isaac M. Mason, General Freight Agent.

—Mr. E. C. Brown, late Master of Transportation, has been made Assistant Superintendent of the Burlington & Missouri River Railroad.

—A company organized in St. Louis on the 1st ult. to construct the Mexican Gulf Branch of the Atlantic & Pacific Railroad chose the following directors: Ozias Baily, Colonel W. H. Coffin, New York; James P. Fisk, Henry T. Blow, St. Louis; Charles E. Harwood, E. T. Robinson, M. J. Hubbell, J. T. Means, Henry C. Young, Springfield, Mo.; J. P. Robinson, Connecticut; E. L. Dohoney, A. S. Johnson, Paris, Texas; W. T. Simmons, Beaumont, Texas. There was no election for president. Dr. A. S. Johnson was elected Vice-President and Henry C. Young Managing Director.

—The stockholders of the Memphis & Kansas City Railroad Company have elected W. G. Ford, of Memphis, President; W. H. Patterson, of Jacksonport, Ark., Treasurer; Geo. S. Picket, Engineer, and S. C. Yans, L. N. Rhodes, R. F. Patterson, John Overton, Jr., and Andrew J. Keller, Executive Committee.

—At the annual meeting of the Marietta & Pittsburgh Railroad Company, held in Marietta January 2, the following directors were chosen: A. J. Warner, Wm. P. Richardson, Samuel Shipman, Wm. H. Frazier, Isaac Morton, A. Wilhelmi, Wm. P. Cutler. A. J. Warner was chosen President and Superintendent; W. H. Frazier, Vice-President; Samuel Shipman, Treasurer; and J. A. Kingsbury, Secretary and General Freight and Ticket Agent.

OLD AND NEW ROADS.

Galveston, Houston & Henderson.

This company has recently made experiments with coal as fuel for its locomotives, and has proved its cheapness on its line as compared with wood, hitherto used exclusively. Coal will be used hereafter in the locomotives fitted for it on the line.

St. Croix & Penobscot.

The engineers engaged by this company to make a survey for the proposed extension of their line to Grand Lake have completed their work, and are now engaged in making estimates. The *Times* says they have obtained a better line than expected, and have met but few natural obstacles. The deepest cut necessary is but 15 feet, while the only grade that is at all heavy is but 90 feet in a distance of three miles. It is their opinion that the road can be constructed at a very reasonable cost.

St. Louis, Kansas City & Northern.

It is reported that this company will purchase a large tract of land in Harlem, opposite Kansas City, for shops, yards, etc. It is about to construct a track of its own from Kansas City for nine miles to its junction with the Hannibal & St. Joseph, on whose track it now enters Kansas City.

An attempt will be made to secure means for the extension of the Boone County Branch of this railroad from its present southern terminus at Columbia southward to the Missouri River opposite Jefferson City, a distance of about 25 miles. The county is asked to vote $80,000 in aid of it.

Wheeling & Tuscarawas Valley.

This company has opened books for subscriptions to its stock preliminary to a permanent organization. It intends to construct a railroad from Wheeling, W. Va., northward through Eastern Ohio to join the Lake Shore and Tuscarawas Valley road and thus form a route from Wheeling to Cleveland.

West Wisconsin.

The general offices of this company were removed from Eau Claire to Hudson, Wis., on the 24th ult.

St. Louis & Iron Mountain.

The Arkansas Branch of this railroad has been opened recently to Mill Springs, 50 miles south of Pilot Knob. The grading is completed nearly to the Arkansas line, and it is intended to have an extension open to Poplar Bluffs, 15 miles south of the present terminus, by 1st of March.

Goshen & Pine Island.

The Erie Railway Company, says a correspondent of the New York *Times*, has leased the Goshen & Pine Island Railroad, now constructing from Goshen, Orange County, to the New Jersey State line, and in running order to Pine Island, 11 miles. The lessees pay $500 per annum to maintain the organization of the original company, and $20,000 a year for the first ten years, and $25,000 a year thereafter. The lease is perpetual.

Maine Central.

By a recent vote of the directors of the Maine Central Railroad Company, the general management of that road is to be under J. M. Lunt, as General Superintendent. There are to be two divisions, known as the first and second. The first will include the old Portland & Kennebec road to Waterville, and from there to Bangor, and branches, under the management of L. L. Lincoln as First Assistant Superintendent. The second includes the old Maine Central from Waterville, and the new extension to Cumberland, with the old Androscoggin, under the management of Arthur Brown as Second Division Superintendent.

Zanesville & Marietta.

The certificate of incorporation of the Zanesville & Marietta Railroad Company has been filed in the office of the Secretary of State of Ohio. The termini of the road are the city of Zanesville and Marietta, and it will pass through the counties of Muskingum, Guernsey, Noble and Washington. Capital stock, $500,000. Corporators, Wm. W. Collins, Benjamin F. Spriggs, R. P. Summers, Wilburt B. Titus and Wm. C. Okey.

Springfield & Farmington.

The directors of this company have resolved that they will construct their road from Springfield, Mass., to the Connecticut State line, provided the Connecticut Western will lease it when completed at a given rental. This, it is said, the Connecticut Western will do, and extend the proposed road from the State line to a connection with their road at Tariffville, and thus open a new route between Springfield and the Hudson.

Detroit River Tunnel.

On the 25th ult., the shaft on the Detroit side was down ninety feet below the surface, and preparations were making for the driving of the drainage tunnel.

Hamilton Rolling Mills.

The rolling mills in Hamilton, Canada, resumed work lately after a suspension for two months.

Car Springs.

A. French & Co., proprietors of the Pittsburgh Cast Steel Works, have, it is reported, received orders for springs for one thousand cars from the Union Pacific.

Lee & Hudson.

The directors of the Lee & Hudson Railroad held a meeting at Lee, Mass., recently, at which Captain George H. Power, of Hudson, N. Y., made an offer for the road when completed. The Boston & Albany has made a proposition, which is not satisfactory; and the former committee were again empowered to wait on President Chapin.

Ashtabula & Jamestown.

A correspondent of the Cleveland *Herald*, under date of the 12th ult., says of this line:

"Work on the Jamestown Branch Railroad, which intersects the Lake Shore & Michigan Southern at Ashtabula, is being pushed forward as rapidly as possible. The track on the north end is now laid a distance of nearly eight miles, and our friends at the county seat—Jefferson—expect to hear the screech of the locomotive by the 15th. On the south end the construction train has reached Andover, shortening the gap to a distance of about 15 miles."

This road will give the Lake Shore road a connection with its Jamestown & Franklin road, which at present is entirely isolated from it.

Cincinnati & Indianapolis Junction.

A suit has been commenced in the United States District Court, at Cincinnati, against the Cincinnati & Indianapolis Junction Railroad Company and others, by James F. Joy, Moses Taylor, John Jacob Astor and Baring Brothers, of New York, and others, based on the purchase of one million dollars of first mortgage bonds, and sixty thousand of the second mortgage bonds of the Fort Wayne, Muncie & Cincinnati Railroad, held by the former company. The complainants averring that the defendants withheld the information of the existence of over three hundred thousand dollars of liabilities against said company, inflicting damage upon them thereby. They ask that all persons having claims against the Fort Wayne road be directed to present them in court.

Mails by the European & North American.

The *New England Postal Record* says:

"The establishment of the International Mail Line between Boston and Halifax, N. S., *via* Portland, Bangor and European & North American road, saves sixty hours in the transmission of foreign mails. At present the mails arriving by steamer from Europe, touching at Halifax, will be carried across the Bay of Fundy by steamer from Annapolis, N. S. The road from Moncton to Truro is nearly finished. Upon its completion the mails will be sent from Halifax to Boston and *vice versa* all the way by rail."

Natchez & Jackson.

The Natchez *Democrat* of the 6th ult. says: "The actual work of construction on the first section of the Natchez & Jackson Railroad was begun last Thursday morning about 9 o'clock by the working force of Messrs. Murphy, Boyle & Cooley, the contractors."

Maine General Railroad Law.

A correspondent of the New York *Tribune* gives the following as the substance of the general railroad law now pending in the Maine Legislature: "The new act authorizes any ten persons (a majority of whom shall be citizens of the State) to form a company, by signing articles, for locating, constructing and maintenance of a railway for public use. The amount of capital stock shall be at least $10 000 per mile, actually raised in good faith. The directors shall show complete and perfect plans and estimates of the cost of construction of the proposed road, with undeviating line of location, and also that five per cent. of the capital stock has been paid in cash. When the Commissioners, of whom there are to be three, are satisfied that all the conditions are fulfilled, they shall notify the Secretary of State, who shall issue his proclamation. No objection shall be considered conclusive or location refused solely because the road may run parallel to or come in competition with any other road. All questions of location, &c., shall be finally passed upon by the Commissioners, who are to be elected by the people on the cumulative voting principle, one to go out every two years, so that the minority

may elect one, and thus take it out of political control. The company shall begin the construction of the road and expend at least five per cent. of the whole cost within two years, and shall finish the road in five years, or be required to forfeit its authority. Each corporation shall have the right to establish tolls on freight and persons, with proper liens and powers; but, upon notice and hearing of aggrieved persons, the Commissioners have power to revise lists and decide what the rates shall be, if they are unreasonably high."

Kansas City & Plattsburg.

Articles of association of the Kansas City & Plattsburg Railway Company have been filed in the office of the Secretary of State at Jefferson City, Mo. The road is to commence at the city of Kansas, Jackson County, and run in a northerly direction by the most practicable route through the counties of Clay and Clinton, and intersect the Chicago & Southwestern road at the town of Plattsburg, in the last named county, or at any other point on said Chicago & Southwestern Railroad which may furnish the most desirable terminus or point of connection. Length not to exceed 50 miles, and the capital stock of the company to be $500,000. The managers for the first year are Charles Long, John W. Polk, Smith D. Woods, Francis C. Eames and James Wood.

Such a line would give the Chicago, Rock Island & Pacific Company a short route to Kansas City, as it now has to Leavenworth and will have in a few months to Atchison.

Northern Pacific.

English railroad and financial journals of the 14th contain the advertisement of £4,000,000 of this company's bonds offered in London by Jay Cooke, McCullough & Co., in which it is stated that the sales previously made in America amounted to more than $10,000,000. This amount would supply more than $40,000 per mile for the section now completed. Of the $20,000,000 offered in London $6,250,000 was subscribed.

American Railroad Loans.

During the third week of January loans for American railroads to the amount of $15,830,000 were placed in Europe, as follows:

Northern Pacific bonds, for Messrs. Jay Cooke & Co., in London	$6,250,000
Central Pacific, San Joaquin Branch, for Messrs. Fisk & Hatch, in Frankfort	6,080,000
Gilman & Springfield Railroad of Illinois, for Messrs. Morton, Bliss & Co., in London	2,000,000
Marietta & Pittsburgh Railroad of Ohio, for Messrs. Marx & Co., in Berlin	1,500,000
Total known for week	$15,830,000

There seems, indeed, to be no limit to the amount Europe is willing to lend us for reputable railroad projects.

Lease of the United Railroads of New Jersey.

In the New Jersey Legislature on the 30th ult.:

Whereas, The United Railroad Companies, composing the Camden & Amboy Railroad Company, the New Jersey Railroad Company and the Delaware & Raritan Canal Company, have leased to the Pennsylvania Central Railroad Company all their franchises, works, equipments and appendages, and all their control and interest in other railroads, ferries, bridges and other property and works held by them at the time of making such lease for the term of 999 years; and

Whereas, The entire people of the State have a direct interest in the proper management of all the great public works; and

Whereas, The State is the owner of a large amount of the capital stock of one or more of said companies, and has reserved to herself the right to their respective charters and the supplements thereto to take each and all of said works at their appraised value, not to exceed first cost, in 1889-90; and

Whereas, In a matter so momentous to the people of the State it is desirable that the fullest information should be given to them of the effect which the said lease will have on the reserved right to take these works at cost; therefore

Resolved, That a select committee of five be appointed by the Speaker to inquire:

First, Into the steps taken preliminary to the execution of said lease by the directors or officers of the companies whose works have been leased.

Second, Whether the terms of the leases are fair and just to the State and to the citizens thereof, and if not, wherein the in justice and unfairness exists.

Third, Whether the terms of the lease affect the right of the State to take the works of said companies at cost, as provided in their charters and supplements thereto, and if so, in what manner, and to what extent; and,

Fourth, Whether any action is now necessary to secure said right or to prepare for its exercise, when the time to take these works, or either of them shall arrive, and that said committee report thereon, with all the evidence taken by them, and that they be authorized to send for persons and papers, to take testimony and to sit during any recess of this body.

The resolutions were unanimously adopted.

Southern Central of New York.

A correspondent of the New York *Times* says: "The Erie Railway Company has leased the newly-completed Southern Central Railroad, running from Owego to Fairhaven, on Lake Ontario, *via* Auburn. The Erie Railway assumes all bonds, stock and debts of the Southern Central; agrees to ballast and furnish the road, and place upon it several hundred coal cars, a large number of passenger and freight cars, and pay three and one-half per cent. dividends on the stock of the road for the first three years. At the end of that time the dividends will be increased, by a sliding scale of rates, to seven per cent., which percentage will be made permanent. The Southern Central is a narrow-gauge, and a third rail will be put down to allow direct shipments of freight from New York to Lake Ontario without reshipment. The great value of the Southern Central road, however, and the object which induced the Erie to lease it, is the fact that it has opened a new coal field to the people of Central and Northern New York, in the semi-bituminous mines of Sullivan County, Pennsylvania. The trade in this coal is already immense, and as the Erie is interested in these mines, and others in Bradford County, the value of the lease is apparent."

Wallkill Valley.

The election of Hon. Thomas Cornell, of Rondout, as a director of this company, is thought to indicate that the Delaware & Hudson Canal Company, with which Mr. Cornell is connected, will have something to do with the new road, which is rapidly approaching completion. The Erie has been operating the road and has made a contract to continue working it for another year, but, it is reported, has tried to lease it.

Havana, Mason City, Lincoln & Eastern.

Taylor, De Land & Co., the contractors for the construction of this road, will receive bids until the 7th inst. for the grading, bridging and culverts of the part of this road between Lincoln and Champaign, Ill., the grading and culverts in sections of from one to five miles; the bridging and piling by itself. The bids will be received at Clinton, Ill.

Taylor, De Land & Co.'s contract requires them to complete the road from Urbana to Havana by September 20.

Wisconsin Central.

The Wausau *Pilot* says: "J. A. Farnham, Esq., who has been below as far as Portage City, in the railroad interest, returned home on Tuesday last, and reports 'favorably' for the construction of the Portage, Stevens Point & Wausau Branch of the Wisconsin Central Railroad."

Northern Pacific.

Official advices received by the President of the company from those in charge of the road at Kalama, Washington Territory, are to the effect that on the 30th of December the first 25 miles of the western end were completed and opened for travel, trains leaving that city and running out to the end of the track. Forty miles more are nearly ready for the rails, which are on the way to their destination.

The section now under construction on that coast can hardly be called any part of the transcontinental line, as it extends from the Columbia River below Portland nearly due north to Puget Sound, where the coast terminus will be. It will open a large district in the Territory, however, now not easily accessible.

Superior & St. Croix.

A recent issue of the Superior City (Wis.) *Times* says: "The profiles of the Superior & St. Croix Railroad, running from this city to the junction of the Northern Pacific, are about completed, and the chief contractor, Captain Starkey, is busily engaged in forwarding men and supplies for the work. On Friday last the work of clearing and making square timber, cord wood, etc., was commenced by Messrs. McLean, Monroe & Doyle, experienced sub-contractors, who have taken two miles at the crossing of Pokegama Creek."

Central Pacific.

This company, it is reported, has recently negotiated a loan of $5,000,000 through Philip Speyer & Co., Frankfort, secured by first mortgage bonds of the San Joaquin Valley Branch.

Atlanta & Richmond Air Line.

This company, whose line is to extend from Atlanta, Ga., northeast across the "up-country" of South Carolina to Charlotte, S. C., now in operation for 53 miles from Atlanta and in large part graded for the remainder of the distance, have placed on the market first-mortgage 8 per cent. bonds at the rate of $16,000 per mile, which are offered at 90. There is a contract to lease this road to the "Southern Railway Security Company," which already controls a line from Baltimore to Charlotte, and has interests in roads beyond Atlanta.

Michigan Railroad Subsidies.

The Detroit *Tribune*, just before the announcement of the decision of the Michigan Supreme Court against the validity of municipal subscriptions to railroads, made the following statement of the subsidies then voted, which, by the recent decision of the United States Circuit Court, will probably be collectable again:

COMPANY.	Amount received from towns by Company.	Amount in hands of third parties.
Jackson, Lansing & Saginaw	$208,000	$208,000
Flint & Pere Marquette	75,000	75,000
*Paw Paw Railroad	36,100	28,100
Kalamazoo, Allegan & Grand Rapids	95,000	95,000
†From White Pigeon to Kalamazoo	103,000	88,000
Michigan Lake Shore	50,000	50,000
Port Huron & Lake Michigan	117,000	117,200
Grand Rapids & Indiana	220,00	220,000
Ionia & Lansing	103,450	95,450
Michigan Air Line	85,500	85,500
Detroit & Howell	48 505	48 505
Other roads	294,200	299,200
Total	$1,445,955	$1,399,955

*Of the bonds of this company $8,000 have already been paid.
†Of the bonds delivered to this company $25,000 have already been paid.

Of action taken under the general law of 1869, as far as the pending cases can affect it, the following is a statement:

COMPANY.	Am't deliv'r'd to comp'y by State Treas.	Am't in third parties' hands
Michigan Air Line	$25 0 0	$25 000
Kalamazoo & South Huron	36,000	36,000
*Chicago & Michigan Lake Shore	97 5 0	13,500
Fort Wayne, Jackson & Saginaw	42,500	23,500
Port Huron & Lake Michigan	42,000	42,000
Other roads	50,000	50,000
Total	$299.0 0	$190.000

* Of the bonds delivered to this road which have not been sold, $4,000 have been paid by a direct tax, and on the remaining $20,000 cash advances have been made by outside parties.

Of the last columns in the foregoing tables the following is a

SUMMARY.

Amount still in hands of third parties:	
Voted under special acts	$1,399,955
" " general law	190,000
Total	$1,589,955

"The result of our investigation may thus be briefly stated: The towns and counties of Michigan have thus far voted to aid railroad enterprises in which they are interested to the amount of about (probably over) $6,000,000. Of this aid about $1,750,000 has been granted upon the diverse conditions embodied in the various special enabling acts to be found in our statute books, and $4,250,000 upon the clear and precise terms contained in the general law of 1869. Of the last named amount over $3,600,000 have already been deposited with the State Treasurer. The companies aided have thus far obtained actual possession of $1,744,955 in bonds, of which $37,000 have been already paid, $118,000 still remain in their possession, and the balance is now in the hands of third parties. This $1,589,955 has been taken by capitalists and corporations, by contractors and employes, by people of all classes and sections."

Governor Baldwin's estimate of the amount of railroad aid bonds fully earned and outstanding at the time of the Michigan decision, given in his message to the special session of the Legislature in 1870, was as follows:

Bonds issued under special acts of 1864 and 1865, approved by Gov. Blair	$858,600
Bonds issued under special acts of 1865, approved by Gov. Crapo	312,700
Bonds issued under special act of 1867, passed over Gov. Crapo's veto	28,000
Bonds issued under laws of 1869, approved by Gov. Baldwin	447,000
Total	$1,656,300

Terre Haute & Southwestern.

Terre Haute voted on the 22d ult., by a very large majority, to subscribe $150,000 to aid in the construction of this road, which it is proposed to build from Terre Haute southwest across Southern Illinois to the Mississippi opposite Cape Girardeau.

Lake Erie & Louisville.

The Lake Shore & Michigan Southern, it is reported, will guarantee the bonds of the above company in order to secure its extension from its present terminus at Findlay to Lima, and preparations are making to complete the extension very soon.

Proposed New Fort Scott Railroads.

Fort Scott, Kan., will vote on the 13th inst. on propositions to subscribe $150,000 to the stock of the Topeka, Fort Scott & Memphis Railroad, and $25,000 to the Fort Scott Division of the Lexington, Lake & Gulf Railroad, the latter to extend from Fort Scott northeast to Butler, Mo., nearly parallel with the Sedalia Division of the Missouri, Kansas & Texas.

Grand Rapids & Bay City.

Grading on this line has been commenced at several points between Wenona and Midland.

Spartanburg & Union.

This railroad, extending from Alston, S. C., on the Greenville & Columbia Railroad, northwestward 69 miles to Spartanburg, will be sold to satisfy claims of the State of South Carolina on the 5th inst., at the courthouse, Unionville, S. C. It was projected as a section of a line from Charleston to Cincinnati *via* Cumberland Gap.

Watsonville & Santa Cruz.

The County of Santa Cruz, Cal., has voted a subscription of $100,000 to aid in the construction of the above road, which is in effect an extension of the Gilroy & Watsonville Railroad (a branch of the Southern Pacific of California) to the coast at Santa Cruz.

Union Depot at Council Bluffs.

Designs have been made for a union depot at Council Bluffs which is to be 200 by 196 feet.

Gilman, Clinton & Springfield.

This company placed in London, through Morton & Rose & Co., $2,000,000 of 7 per cent. first-mortgage gold bonds, principal payable in gold to the holders September 1, 1900, by this company, or at par, in lawful money of the United States, by the Illinois Central and Pittsburgh, Cincinnati & St. Louis Railway Company, out of funds to be raised by setting aside 15 per cent. of the gross receipts from traffic interchanged between them, according to the terms of a contract made by the three companies. The bonds are convertible into stock of the company, and the holders have the option of accepting par in currency for bonds to be drawn annually sufficient to exhaust the amount set aside from earnings. The bonds were offered at 90, gold, and were reported taken the same week.

St. Augustine & Tocoi.

This short line between the St. John River in Florida and the sea coast at St. Augustine, laid with wooden rails, is to be operated henceforth with horse cars. An attempt was made for some time to operate the road with steam power, which has not been successful enough to warrant its continuance. Mr. M. L. Hartridge has made a contract for operating the road, which is about 16 miles long.

Manitoba Traffic Routes.

A correspondent of the Toronto *Globe* says:

"Judging from the numerous notices of application to Parliament for railway charters, it would be fair to infer that Manitoba is not much longer to be so void of communication facilities as at present. Apart from the Canadian Pacific, no less than five different railway schemes have been brought upon the boards in this manner. Some time ago, notice was given of application for a charter for a line between Pembina and Portage la Prairie; later, for one between the former place and Fort Garry; still later, for one between the latter place and the northwest angle; and, latest of all, for the construction of a road from Pembina to Fort Garry, with power to extend the same to Lakes Winnipeg and Manitoba, and also with powers to navigate the above lakes and Lake Winnipegosis and the River Saskatchewan. The latter project is the one the successful issue of which would confer the most good, and at the same time, from present indications, is the most promising of reality. The fact of such names as Donald A. Smith, M. P., Sir A. T. Galt, M. P., Daniel Torrance, John Carling, M. P., George Stephen, Donald McInnis and George Laidlaw being subscribed is accepted by our people as a favorable augury. There is little doubt but that the American railway to Pembina will be completed by the end of this year; and a reasonable expectation of a speedy extension of that line to the interior of this country is a matter for much congratulation with us.

"I am glad to be able to say that the steamboat facilities of the country are to be very materially increased. The Hudson Bay Company is building two boats at Lower Fort Garry—one for Lake Winnipeg and the other for River Saskatchewan. N. W. Kitson is now building a boat at Breckenridge, Minn., which will be placed on the Red River next spring."

Toronto Railroads in 1871.

The "annual review" of the Toronto *Globe* gives an account of the construction of railroads leading to that city during the year 1871, which we summarize as follows: The Toronto, Grey & Bruce was extended to Mount Forest, 88 miles from Toronto. A branch from Orangeville to Owen Sound was renewed and its construction commenced, and the construction of the extension from Mount Forest to Kincardine was commenced, and bonuses voted for it as far as Teeswater.

The Toronto & Nippissing was extended to Woodville, 65 miles from Toronto.

The Muskoka Branch of the Northern Railway was completed to Orillia, and the North Grey Branch is being extended to Meaford, halfway between Collingwood and Owen Sound.

The Canada Midland is extending its line to Orillia.

Nova Scotia Railroad Projects.

Lines are projected in this province between Annapolis and Yarmouth, Annapolis and Liverpool, New Glasgow and the Strait of Canso, from the Strait of Canso to Louisbourg and others in Cape Breton.

Brownville & Fort Kearney.

Nemaha County, Neb., has issued $40,000 in its bonds to this company, which has ten miles of its road completed.

Fort Scott, Humboldt & Arkansas Valley.

The railroad, now graded from Fort Scott westward to Humboldt, Kan., it is now proposed to extend across Greenwood and Butler counties, crossing the Arkansas River at Wichita, extending up that stream to Hutchinson, the county seat of Reno, where it will cross the Atchison, Topeka & Santa Fe, and thence northwesterly up Crow Creek, through Atlanta, to Ellsworth on the Kansas Pacific.

St. Louis to St. Paul.

Trains now run through between St. Louis and St. Paul by the route heretofore described, *via* Austin, Minn., Plymouth, Cedar Falls, Cedar Rapids, Burlington, Iowa, La Harpe, Bushnell and Beardstown, Ill. Trains leave St. Louis at 6 a. m., and reach St. Paul at 11:20 a. m. of the next day; and returning leave St. Paul at 4:50 p. m., and reach St. Louis at 10 p. m.

North Pacific.

A California company of this name proposes to construct a railroad from Saucelito, Marin County, through that and Sonora County 90 miles to Walhalla River.

San Diego & Los Angeles.

This company is about to make surveys for a line from Old-town to Los Angeles through Pawn, San Luis Rey, Santa Margareta, San Juan Capistrano and Anaheim, with a branch from Anaheim to San Bernardino.

Denver & Rio Grande.

The road is ready for the iron and tiles for 25 miles south of the present terminus at Colorado Springs, and the iron is reported to be on the way. The road is said already to have developed a considerable traffic.

The Proposed Missouri Subsidy Law.

The following summary of the provisions of this law is furnished by a correspondent to the Missouri *State Times*:

"It is intended to make the State a guardian over each road that will survey, locate, grade and iron, and put the rolling stock upon the same, and for every ten miles of such road so completed and ready to carry freight and passengers, to receive $7,500 per mile. These roads to pay into the treasury of the State, on the 1st day of October of each year, two per cent. of the gross earnings of such roads forever.

"Whenever, and as fast as every ten miles of road is completed, and the cars running upon the same, the companies building such roads are to notify the Governor of the completion of said portion, whose duty it shall then be to have the same inspected by competent commissioners, upon whose report the aid desired shall be paid. This only to apply to roads now under course of construction, or those that are to be hereafter built with a gauge of 4 feet 8½ inches, and also to all roads whose gauge is not less than 3 feet, which roads shall receive $5,000 per mile, with all the provisions governing the first, and also the 2 per cent. of the gross earnings of the roads of such narrow gauge.

"The State of Missouri to hold a first lien on all such roads for the prompt payment of said 2 per cent. annually, and in case of failure on the part of these roads, or any of them, to pay this 2 per cent., then the Governor to seize said roads and their rolling stock, and after giving twenty days' notice by publication to sell the same in Jefferson City, or so much of road-bed or rolling stock thereof as to fully pay the 2 per cent. of the gross earnings.

"The State to have the right to regulate the rates of passage and freights passing over such roads, and to tax them as may be regulated by law.

"To prohibit courts from subscribing to any road in any county in the State that accept this aid, unless authorized so to do by a two-thirds majority of the voters of such county.

"The Governor, State Auditor and Secretary of State to be constituted a board of commissioners, with power to examine the books, papers and business of any roads that have accepted such aid at any time they may deem it to the interest of the State to do so.

"When the 2 per cent. is paid, to first be applied to the interest on bonds, and the remainder to be used as a sinking fund to pay off the bonds as soon as there is sufficient fund created for the purpose by such revenue, and the State to have the right to call in the bonds and pay them off at any time before maturity."

This correspondent prophecies all kinds of advantages to Missouri from such a law, and closes with the following thrilling appeal, which certainly must stir the hearts of the veriest Pikes:

"It is within the power and province of the present legislative body to give Missouri the foremost rank as a manufacturing and mineral-bearing State. It is within their hands to give us at this session the wand of power, to wield a proud destiny over the State of Missouri. To hesitate, is to be lost—the path of safety is forward! If we will not now grasp the elements of success, when they are within our reach—if we gaze upon our position with catoptrical visions of those who think we have reached complete success, and will not strive to a higher eminence, then the proud day of Missouri's success and fulfillment of a brilliant destiny is far in the future."

Cincinnati & Muskingum Valley.

This company offers in New York and Philadelphia 7 per cent. first mortgage bonds at the rate of $10,000 per mile at 90. This is the old Cincinnati & Zanesville road, which now has a connection with the Panhandle at Dresden, and forms a branch of the Pennsylvania Company's system, giving it, in effect, a second line into Cincinnati.

North Wisconsin.

This railroad, now completed from Hudson, Wisconsin, northward 20 miles to Richmond, is to be operated for the present by the West Wisconsin Railway Company.

Sheboygan & Fond du Lac.

A contract has been let for fencing this road its entire length from Sheboygan to Princeton, 75 miles.

Wisconsin Valley.

This railroad is intended to extend from Tomah northeast to Grand Rapids, Wis. Tomah has voted aid to it recently.

Baltimore & Ohio.

The company's new elevator at Locust Point, Baltimore, was first opened to receive grain on the 22d ult. It has a capacity for 600,000 bushels in separate bins of 5,000 bushels each. The grain received will be subject to inspection, and the receipts will be good for grain of the quality named on them, as in the lake elevators. The chief supply for this elevator is expected by the company freight lines to St. Louis, Chicago and Sandusky.

Peninsular of Michigan.

A correspondent of the Detroit *Tribune*, writing from Battle Creek, Mich., last month, says:

"The Peninsular Railway Company, at its annual meeting in this city on the 17th, re-elected its present officers for the ensuing year.

"An attempt was made by a Mr. Hopkins, with whom the company had contracted to supply the iron and rolling stock of the road, to "gobble" it up, after the manner of the defunct Jim Fisk. The said Hopkins, it seems, had secured control of sufficient stock to enable him to elect himself President of the road, and fill all the other offices with men of his choice. At the same time Hopkins had failed in fulfilling his contract, to the great detriment of the interests of the road. On the arrival of Hopkins to carry out his scheme, he was immediately arrested on a charge of gigantic fraud, and in default of the required bail was locked up. In the meantime the company proceeded to the election of their officers undisturbed by Hopkins, who acknowledges himself fairly beaten. The Peninsular Company have over 100 miles of their road ironed, but lack greatly in rolling stock, due mainly to the delinquencies of Hopkins."

Massachusetts Railroad Projects.

The following are among the new lines for which authority is asked of the present Massachusetts Legislature:

Fall River wants a line to Mansfield; Northborough to Uxbridge; Belchertown to Springfield; Watertown to Brighton; Brookline to Needham; Ashburnham to Groton; Lowell to Andover; North Bridgewater to Mansfield; and Lynn, Cambridge, Brighton and Brookline desire new lines to Boston.

Hamilton & Lake Erie.

Mr. A. H. Askin, the Chief Engineer, advertises for tenders for the construction of 15 miles of this railroad, from Hamilton to Caledonia, to be delivered at the President's office, Hamilton, Canada, by the 15th inst.

Railroad Land Grants.

The communication from Secretary Delano, sent to the House in reply to its resolution of the last session, shows that the total amount of public lands within the limits of the grants to railroad companies is 216,200,296 acres, of which 148,675,166 have been granted to the Pacific railroads. The companies will actually receive of their total grants 199,053,436 acres, and up to the close of the last fiscal year had entered and patented 23,684,918 acres.

Lake Superior & Mississippi.

A statement of the receipts and shipments of this company at Duluth during the year 1871 shows that it carried to Duluth 170,907 barrels of flour and 1,401,529 bushels of wheat. The heaviest shipments were of railroad iron and coal.

Green Bay & Lake Pepin.

The surveying party has been running a preliminary line between New London and Grand Rapids, 60 miles, crossing the Wisconsin near the mouth of the Plover River, about two miles and a half from the village of Plover. The company have recently received 2 locomotives, 30 flat cars, 10 box cars and a caboose car.

Wood County has voted to subscribe $50,000 to the stock of this road.

A City "Transportation Bureau."

The Cincinnati Board of Trade has established a "Transportation Bureau," whose main object is the prevention of a discrimination in freight rates against Cincinnati, such as is much complained of there. Mr. James H. Foote, who has been long in the freight business, recently in the service of the White Line, is appointed Superintendent of the Bureau.

Houston & Texas Central.

The track on the branch of this road known as the "Waco Tap," is to be laid as far as Marlin, about 30 miles northwest of the junction with the main line, by the 10th inst.

Champaign, Monticello & Decatur.

This railroad, which was ready for the rails, or very nearly so, more than two years ago, is at last completed and has trains running from Champaign southwestward to Monticello, about 18 miles.

Canada Southern.

In a speech at East Saginaw recently, Mr. W. A. Thomson, the president of this company, made the following statements:

"He was simply here to put the Canada Southern in a right light. It was generally believed there was nothing in it. It is still reported there is nothing doing, but this is a mistake. We graded 207 miles of road last summer, and 1,200 men have been employed all winter. The ties are all out for the road, bridges all built, right of way all paid for, and the road-bed will be ready for the steel about the 1st of May, and the steel is all paid for. We have applied to the Canadian Parliament for a charter to build a bridge across the St. Clair River, and across the Detroit River at Amherstburg."

St. Paul & Iowa Southern.

Several Iowa corporations formed a consolidation under the above name at Montana, Iowa, December 23. The new company proposes to construct a railroad from Mason City southwest to Webster City, and thence a little west of South through Boone to Bedford, Taylor County, near the Missouri line, whence the Kansas City, St. Joseph & Council Bluffs Railroad (Marysville Branch) would give it a connection with Kansas City. Such a line would pass through a fine country, but in a direction where there is little traffic.

Railroad Subsidies in Mississippi.

A strong effort has been made lately to repeal the law of this State authorizing aid from the State to all new roads at the rate of $4,000 per mile, but it has failed in both branches of the Legislature.

Cincinnati Southern.

The Kentucky Legislature has finally passed a bill authorizing the construction of this railroad, which the city of Cincinnati proposes to construct across Kentucky and Tennessee to Chattanooga, with a branch to Knoxville.

November Earnings of Canada Railroads.

The *Canadian Monetary Times* gives the following tabular statement of the receipts of the various Canadian railroads during the month of November:

	Passengers.	Mails and Sundries.	Freight ...	Total 1871.	Total 1870.	Miles.....
	$	$	$	$	$	
Great Western.....	128,476	11,245	271,687	411 628	340,127	251
Grand Trunk.....	194.547	24,000	559,225	777,772	606,423	1,347
Welland Railway.....	1,106	495	6,267	7,868	10,864	25
Northern Railway.....	13,644	2,595	33.8 5	50,044	38,800	97
Midland of Canada.....	4,718	360	12,110	17,188	12,507	56
Brockville & Ottawa.....	6,018	419	18,296	24 734	24,782	86
Canada Central.....	2,858	....	955	3,313	2,753	28
St. Lawrence & Ottawa.	5,162	964	5,204	11,330	11,525	54
St. Lawrence & Industry	348	....	1,016	1 364	1,0 6	..
N. Brunswick & Canada	3,860	12,806	....	16,166	13,749	116
European & N. American	9,987	2,210	13,496	25,693	21,196	108
Nova Scotia Railway...	9,171	830	21,943	31,944	31,235	145
Total.....	379,576	55,424	964,954	1,408,956	1,114,917	2,443

This is an average of $570.50 per mile per month, or about $6,840 per year. The Grand Trunk reports very nearly the average—$565 per mile; while the Great Western is away above it with $1,170 per mile.

Wellington, Grey & Bruce.

This branch of the Great Western of Canada is now completed and has trains running as far as Walkerton, within 30 miles of the Lake Huron terminus. The road-bed is ready for the entire distance.

Lehigh Valley.

The following account of the business and receipts of this road was given in the late annual report:

"The total coal tonnage for three years is as follows:

For 1869	2,331,407 tons.
" 1870	2,622,433 tons.
" 1871	2,8e9,074 tons.

"Of which last amount 1,715,220 tons have been carried in the four months from July 31 to November 30 (the close of our fiscal year), showing a carrying capacity of over five millions of tons if the trade could be evenly distributed throughout the year.

"Our passenger and general freight business have continued to increase.

The receipts from all sources (including interest on investments, income from coal, land, etc.) amounted to	$5,902 382 23
Operating expenses of the road	3,462,029 78
Net income	2,440,352 45

Lake Shore & Tuscarawas Valley.

An officer of this company writes to us as follows:

"The 'Lake Shore & Tuscarawas Valley Railway Company' was organized by the election of officers, March 21, 1871. It is authorized to construct a railroad from Elyria, on the Lake Shore & Michigan Southern Railway, to Dennison, on the 'Pan Handle Line.' Its route is through Grafton, Medina, Massillon—where it crosses the Fort Wayne road—Canal Dover and New Philadelphia. From a point about 15 miles north of Massillon it lies in the valley of the Tuscarawas River, a valley rich in coal of the finest quality and in the black band iron ore so much valued for making the highest grades of foundry iron. These mines are already well opened and responsible parties guarantee to the company 200 cars of freight per

day going north, from the day it is opened. This, with the return freights, makes its financial success certain.

"In the summer of 1871 the contract for building the road was let to Mr. S. Chamberlain, of Cleveland, well known as a railroad builder, and it is now opened and in operation from Grafton to Seville, about 25 miles. Ten miles more will be put in operation in a few weeks, and the whole road from Elyria to Dennison (92 miles) will be finished by November, 1872.

"The following is a list of officers: W. S. Streator, President; S. T. Everett, Treasurer; Wm. H. Grout, Secretary; Robert Moore, Chief Engineer, Cleveland, O."

Newark, Somerset & Straitsville.

Trains are now running to the tunnel, a distance from Newark of 39 miles, the road being complete to that point. At the tunnel about 350 feet remain to be excavated, and a large force of men are now at work on it night and day. The remaining portion of the road, running south of the tunnel about five miles, is already graded and ready for the ties. The entire line will be completed by the 1st of April, the time it passes by lease into the management of the Baltimore & Ohio road.

Warren & Venango.

The surveys are completed from Warren to Garland, which finishes up the entire line. Between the points named the line runs parallel with and close to the Philadelphia & Erie road. Just east of the Brokenstraw at Irvineton, and in front of the old Cornplanter Hotel, it tunnels the spur of the hill.

Cincinnati, Wabash & Michigan.

A correspondent informs us that the company whose railroad was described in the history of railroad construction in 1871 published in our issue of January 13 as the "Warsaw, Goshen & White Pigeon," was consolidated last June with the "Grand Rapids, Wabash & Cincinnati" Company, under the name given above, and has completed and put in operation 20 miles of line more than the section between Goshen and Warsaw, described in that article, as far as Manchester, Ind. It has, moreover, the road-bed completed 14 miles farther south to Wabash, and the iron ready to lay.

The line of the road is from White Pigeon, Mich. (18 miles northeast of its present northern terminus at Goshen), nearly due south to the Pittsburgh, Cincinnati & St. Louis Railway at Anderson, a distance of 128 miles. The section from Wabash to Anderson is to be completed within the current year.

The following are the officers and directors of this company:

Ransom Gardner, President, Kalamazoo, Mich.; C. Cowgill, Vice-President and Treasurer, Wabash, Ind.; E. W. H. Ellis, Secretary, Goshen, Ind.; A. G. Wells, General Superintendent, Warsaw, Ind.; W. G. Millard, General Freight and Ticket Agent, Warsaw, Ind.; A. V. Peck, Chief Engineer, Wabash, Ind.

The directors are:

R. Gardner, Kalamazoo, Mich.; Jos. H. Defrees, E. W. H. Ellis, Goshen, Ind.; A. T. S. Kist, A. G. Wells, C. W. Chapman, Warsaw, Ind.; Jacob Harter, Manchester, Ind.; C. Cowgill, David Kilpatrick, Wabash, Ind.; James Brownlee, Chas. S. Tibbetts, Marion, Ind.; Thomas H. Stillwell, Milton G. Robinson, Anderson, Ind.

The general office is at Warsaw, Ind.

The company has made a contract with the Lake Shore & Michigan Southern for an interchange of traffic.

Florida Railroads.

The union of the two leading railroads of Florida under one management is announced as follows in a circular dated January 15, from F. B. Papy, General Ticket Agent:

"I take pleasure in informing you that the management of the Jacksonville, Pensacola & Mobile Railroad, from Jacksonville, Florida, to Chattahoochee, Florida, and the Florida Railroad, from Fernandina, Florida, to Cedar Keys, Florida, has this day been combined, and that they will in future be operated under one management.

"Your attention is especially invited to the fact that by this combination an entirely new route is now opened to travelers to Cuba, Key West, and other points upon the Gulf of Mexico, via Savannah, Jesup, Live Oak, Baldwin and Cedar Keys, and that every effort will be made by the management to secure the comfort and pleasure of the traveler. Pullman's palace sleeping cars leave Savannah every evening, which, combined with the elegant coaches built by Jackson & Sharp, render us equal in point of equipment to any road in the South. The steamships of the New Orleans, Havana & Florida Steamship Company, with which we form a weekly connection at Cedar Keys, are of a superior class, and have been built with great regard to strength and safety, and in the outfit of their saloons and state-rooms, and in their table, are believed not to be surpassed. One of these ships will leave for Havana and Key West every Saturday."

How far this combination will affect the operation of the roads as lines to the Atlantic coast does not appear. Jacksonville, the terminus of the one, is some distance up the River St. John, which is navigable, it is true, by a certain class of ocean steamers, but is not always easily entered, on account of obstructions at its mouth. Fernandina has a good harbor, but has heretofore had no favor from the Jacksonville road, while its own road, the Florida, has a very light business, running through a comparatively unsettled country. If trains should be run through to Fernandina as well as Jacksonville from the Jacksonville, Pensacola & Mobile road, it would affect its business prospects very favorably. But Jacksonville is now much the most important town, and for the present an impartial management, giving equal facilities for the business of either road to reach either place, would doubtless help it.

Shenango & Allegheny Valley.

Ties are being placed on that portion of the road recently graded to near Pinegrove; and also the grading of five additional miles has been let to the same contractor. This will take the road to Keister's farm, two or three miles into Butler County.

Lexington & St. Louis.

The latest news from this branch of the Missouri Pacific is that it is not completed, as has been reported, but that there remains 14 miles of track to lay.

Sioux City & Pembina.

This company, it is reported, has let a contract for grading of 100 miles, from Sioux City to Sioux Falls, Dakota Territory. Douglas, Brown, Reynolds & Co., builders of the Texas International road, are the contractors.

Grand Trunk.

The company has let a contract for the erection of a passenger station on their property on the esplanade, between York and Simcoe streets, Toronto. Mr. R. J. Reekie is said to be the contractor, and the price named is about $200,000, which ought to pay for a fine structure.

Grand Rapids & Newaygo.

It is reported that 23 miles of this new Michigan road are graded, 2 miles ironed and 12 remain to be graded.

Big Rapids & Muskegon.

This proposed road would form virtually a branch of the Chicago & Michigan Lake Shore. Big Rapids is trying to raise $50,000 in aid of it.

Detroit & Bay City.

Nearly all the subscriptions required preliminary to commencing the construction of this road have been made, except the $50,000 asked from Detroit.

Street Railroads.

A street railroad was opened in Fort Wayne, Ind., on the 6th ult., and one in Denver, Colorado, about the same time. L. C. Ellsworth is President of the Denver company.

Port Austin Wooden Railroad.

A railroad which is to have wooden rails is to be constructed from Port Austin, on Lake Huron, in Huron County, Mich., westward 15 miles, and is to be in operation by the 1st of July.

Grand Rapids & Indiana.

This company has established a new station at a point two miles south of Clam Lake and 25 miles north of Paris, to be called "Tustin." It is in the midst of a considerable Swedish settlement.

There is a movement toward constructing a branch of the road to Manistee.

Toledo, Ann Arbor & Northern.

The engineer reports that the line of this road, as finally located, between Ann Arbor and Toledo, will pass about half a mile west of the village of Milan and half a mile east of Dundee, and will be 40 miles long. It will cross 60 wagon roads and three railroads—the Detroit, Hillsdale & Indiana five miles from Ann Arbor; the Chicago & Canada Southern, 24¼ miles; and the Lake Shore & Michigan Southern, 27¼ miles. There will be no curve of less than 2,865 feet radius, except in the city of Ann Arbor. The highest grade will be 52.8 feet per mile, and that for a very short distance. The estimates are for 242,500 cubic feet of embankment, and 84,000 of excavation, and 350 feet of pile and trestle bridging.

Mississippi & Northwestern.

This company, organized in June last under the general incorporation act of Iowa, proposes to lay a track from Keithsburg, Ill., to Council Bluffs. The survey and estimates have been made from Keithsburg to Oskaloosa, and an engineer corps is now running the line to the western terminus. Local aid has been pledged by all the counties on the line west from Oskaloosa to Adair and Cass. Over $250,000 of local aid has already been actually secured on the east end of the line. It is reported that the "Pennsylvania Company" will construct and operate the road if sufficient local aid is subscribed.

Closing Transfer Books.

The President of the New York Stock Exchange has requested the various railroad companies which have offices in the city and whose stocks are actively dealt in to keep their transfer books open daily until 2:15 p. m., except on days of closing before an election, payment of dividends, etc., when they are asked to keep them open until 3 p. m.

Sheboygan & Fond du Lac.

A correspondent informs us that the track on the extension of this railroad west of Fond du Lac was completed to Ripon, 20 miles, on the 19th inst., and trains were to begin running regularly by this time over that section. Meanwhile, track-laying is progressing, and will soon reach Princeton, 15 miles west of Ripon, which is as far as the road is graded. Preliminary surveys have been made for a section from Wautoma (18 miles northwest of Princeton) northwest to Grand Rapids, 35 miles, and a party will soon be at work on the section between Princeton and Wautoma.

St. Joseph & Denver.

Beyond Fairbury, which is the present terminus of the track of this road, the grading and masonry are completed for 11 miles westward to Big Sandy, and only a little bridging remains to be done to complete road-bed ready for the track. The contract for the construction of the remainder of the road, from Big Sandy northwest to the Union Pacific near Fort Kearney, a distance of 130 miles, has been let to Saxton & Hastings, who are to complete it ready for trains by the 1st of November next. Engineering parties are now locating the route. This firm constructed the St. Louis & St. Joseph Railroad, and is a strong one, Mr. Saxton being a banker of St. Joseph, and Mr. Hastings an experienced and energetic railroad builder.

Toronto, Grey & Bruce.

The line, says the Toronto *Globe*, has been finally located from Mount Forest, *via* Harriston as far as Gorrie and Wroxeter Station. Mr. Robinson, the engineer in charge of the survey, reports having found a very favorable line. He has been instructed to proceed at once and continue the location of the road from Gorrie and Wroxeter Station to Teeswater.

Glasgow & Cape Breton.

This company, which is constructing a railroad through the coal mines in Cape Breton, Nova Scotia, has resolved to extend it to Louisburg, where there is an open winter harbor, and for this purpose has increased its capital £200,000. It is expected to be of great value to the coal trade.

Nova Scotia Railroad.

A round-house of this railroad at Richmond was burned recently, and with it were destroyed ten locomotives of that railroad and one belonging to the Windsor & Annapolis road. This destroys more than half of the motive power of the Nova Scotia road.

Marquette & Ontonagon.

The statement of freight traffic on this railroad for the year 1871 shows that it carried eastward 433,688 tons of iron ore, from 14 different mines, 361,123 tons of which was shipped through to Marquette, and the rest to local furnaces. It carried eastward also 27,577 tons of pig iron from seven furnaces; while the entire amount of other freight carried in that direction was only 6,998 tons, so that of the entire tonnage eastward of 468,263 tons, more than 92¼ per cent. was iron ore, and nearly 6 per cent. pig iron.

On the other hand, the total tonnage carried westward was only 38,848 tons, 17,567 tons of which was ore carried to local furnaces.

The report of passenger business shows 41,651 carried east and 43,678 carried west.

THE SCRAP HEAP.

Reversing a Locomotive.

A correspondent of the *English Mechanic* made the following inquiry:

"If a driver reverse his engine when traveling at a high speed, will he not run the risk of blowing off the cylinder covers? Can he set the valve so that the engine does not take steam? If not, what should a driver do in the event of the regulator breaking so that he lost control over the engine?—GIFFARD."

To this the following replies were made in a subsequent number of the same paper:

"It throws a great strain upon everything to reverse your engine when running. To shut off the steam when your regulator breaks, place your reversing lever perpendicular, and shoot your bolt in the center notch; if adjusted properly no steam can pass the slide-valve to cylinder.—JACK OF ALL TRADES."

"1. No; because directly the steam begins to act on the opposite side of the piston it would begin to exhaust. 2. Yes; by putting the lever into the center notch of the quadrant.—W. SMUGGY."

"Reversing an engine when in motion is a mal-practice to which no competent driver resorts unless in cases of the most extreme emergency. The danger, however, does not so much attach to the cylinder cover, but it places so severe a strain upon the motion work, that often damages that and the frame work to which it is attached. The action is that of suddenly opposing the whole steam force upon the pistons almost instantaneously to the whole momentum of the train; the result to the machine must speak for itself. A careful, competent driver will not probably have occasion to resort to such expedient above once in a lifetime, and then only when his own life and the lives of those intrusted to his charge becomes paramount to the cost of repairs of the machine intrusted to his care. With regard to the dilemma pointed out by 'Giffard,' in a properly-constructed engine, when at rest and the reversing handle in mid-gear, the regulator can be opened with impunity; but as a rule, while the engine is in motion from the nature of the link motion there is always a slight movement of the valve, even in mid gear; hence in the first place in the case of such an accident the driver would first put his lever in mid-gear, and order the brake to be applied by his fireman, and whistle for his guard to do the same, especially if near a station. I see no reason why a good driver should not telegraph forward to the first station where a pilot engine was kept, and, warning the station-master of his crippled condition, proceed on with his train and, working with reversing lever and brakes only, safely reach a point where a change of engines could be effected and little or no delay arise. I have been connected with our railway system during the last twenty-eight years, and have never heard of a regulator breaking during that time: but I have met with many cases of the old disc regulator valve leaking, either from over-use before proper attention has been bestowed upon them, or even grit getting between the surfaces, most probably from priming and dirty water."

Winona Bridge.

The new iron draw bridge over the Mississippi at Winona was swung for the first time on the 13th ult. The draw is 360 feet long. It was constructed by the American Bridge Company.

Stevens Institute of Technology.

The lectures on industrial topics announced for the month of February at the above school of mechanical engineering will commence at 8 o'clock p. m.

The Institute has recently acquired a full set of Patent Office reports, which our readers and others may consult without charge from 8 a. m. to 5 p. m. The later reports are received as fast as issued.

Lynn Passenger Station.

The Eastern Railroad Company has made a contract for the construction of a new passenger station at Lynn, Mass., which will cover an area of 89 by 287 feet, constructed of brick, iron and slate.

Taylor Locomotive Tires.

Taylor Brothers & Co., the manufacturers of these tires, call attention to the fact that the Master Mechanics' Association report on steel tires reports the service of only seven sets of their tires, while there are 986 sets running in the United States, although one of the latest brought into the market. Some notable instances

of good service are reported, in addition to those included in the Association's report. A passenger locomotive, weighing 31 tons, on the Rutland & Burlington road, has run with these tires since December, 1868, 129 000 miles, with a wear not exceeding 3-16 of an inch. Another passenger engine on the same road, 27½ tons, running chiefly north of Rutland, ran 69,910 miles between February, 1868, and January, 1870, and the tires were then turned off, having worn 1-16 of an inch. A freight locomotive, weighing 28½ tons, after running 57,355 on the heaviest grades of the road with heavy trains, was worn a trifle more than 1-16 of an inch. A 30-ton freight engine hauled heavy trains 32,000 miles, and wore the tires off 3-32 of an inch. A 29-ton freight engine ran with heavy trains on the steepest grades of the road 40,000 miles, with a wear of not more than 1-16 of an inch. All these are reported by Mr. N. L. Davis, Master Mechanic of the Rutland & Burlington Railroad. The Boston, Hartford & Erie reports that one of its engines with Taylor tires ran 115,229 miles with a wear of not more than ⅛ of an inch.

Brick-Dust Cement.

The *Journal of the Franklin Institute* publishes the following letter from Mr. F. B. Miles, of the firm of Ferris & Miles:

"It may not be generally known among builders in this country, or to the majority of your readers, that in the Spanish dominions ordinary brick-dust, made from hard-burned, finely pulverized bricks, and mixed with common lime and sand, is universally and successfully employed as a substitute for hydraulic cement.

"The writer, during an engineering experience of six years in Cuba, had ample opportunity for testing its merits, and found it in all respects superior to the best Rosendale hydraulic cement for culverts, drains, tanks or cisterns, and even for roofs; whether for setting flat tiles or for making the usual tropical concrete flat roof.

"It is regularly known there as an article of commerce, sold in barrels by all dealers in such articles at the same price as cement. The proportions used in general practice are one of brick-dust and one of lime to two of sand, mixed together dry and tempered with water in the usual way. A greater or less quantity of the brick-dust is sometimes employed when considered desirable. The writer cannot say whether this composition has ever been tried in this country, or whether it would retain its virtues when subjected to the action of frost.

"It would seem, however, that it could be produced at a lower rate than cement, by the addition of pulverizing mills to our brick-yards to utilize the waste and broken bricks; and if found successful, its manufacture might be worth considering by those who are interested in such products."

The editor adds the following note:

"Under the paragraph headed 'Hydraulic Cements,' in Trautwine's Engineers' Pocket-book (recently published), mention is made of the same material; from which it appears that it is considerably used in France. The author of the work in question pronounces it, from his own observation, to be decidedly hydraulic—a block of the same one-half inch in thickness, without sand, after immersion in water for four months, bore, without crumbling, crushing or splitting, a pressure of 1,500 lbs. per square inch. The opinion is further expressed that the addition of even as little as one-tenth as much brick-dust as sand to our ordinary mortars would prevent the disintegration so generally visible in the mortars used in masonry."

The First Locomotive in Illinois.

A correspondent of the St. Louis *Republican* contributes the following bit to the history of the railroad in Illinois:

"Illinois now has 5,725 miles of railroad. The first rail was laid at Meredosia, May 9, 1838, on the first division of what was called the Northern Cross Railroad. The first locomotive arrived at Meredosia September 6, 1838, on the steamboat Chartson. This pioneer locomotive was built by Grosvenor, Ketchum & Co, at Paterson, New Jersey. It was put on the track, of which eight miles were laid, on the eighth day of November, 1838. The civil engineer, under whose supervision the road was built, and who then and there brought the 'iron horse' into harness—the first in the Mississippi Valley—was George P. Plant, the late President of the Union Merchants' Exchange, and one of the best citizens of St. Louis.

"On that engine, which ran eight miles and returned, were Governor Duncan, of Illinois; Murray McConnell, State Commissioner; James Dunlap and Thomas I. January, contractors; Charles Collins and Miron Leslie, of St. Louis, and the Chief Engineer of the road, George P. Plant.

"There were then less than 2,000 miles of railroad in all the United States. There are now over 60,000. Yet the first locomotive of the Mississippi Valley only put itself in motion thirty-three years ago last November."

Richmond, Ind., Passenger Station.

An exchange describes as follows a new passenger station now being erected at Richmond, Ind.:

"The building is 250 feet long by 86 wide. Height of towers, 67 feet. It is entered by three tracks, one through the north and two through the south arch. In the south side will be the ladies' and gentlemen's waiting rooms; the former 20 by 42 feet in size, and the latter 20 by 54; ladies' dressing room, ticket office, baggage room, express office, kitchen and dining-room. In the west end will be four commodious offices to be occupied by officials of the road. The architecture is of modern style, and superior to that of any other railroad depot in the State. The towers are dressed up with cut stone corners, and crowned with ornamental work of handsome design. The roof is Mansard and covered with slate, making it substantially fire-proof from without."

Leavenworth Passenger Station.

Leavenworth claims to have by far the finest and most substantial depot in the West. It was built by the Leavenworth, Atchison & Northwestern Railroad Company, the ground being broken in May last. The entire dimensions, including the tower on the northwest corner, are 61x202 feet, and the iron supporters of the roof are twenty-five feet above the track. The tower is 18x18, and 75 feet high.

Baldwin Locomotive Works.

The Northern Pacific has contracted for fifty new locomotives from these works, which have supplied it with the largest part of its present stock.

Empire Car Works.

Mr. Michael Schall, the proprietor of these works (at York, Pa), has added to them recently a brick building 260 by 71 feet, two stories high, with two tracks running through it lengthwise, giving room for the erection of eight or ten passenger and fourteen to eighteen freight cars at once.

A Railroad Foundry.

The Aurora *Beacon* says that the new foundry of the Chicago, Burlington & Quincy Railroad Company, in Aurora, Ill., is 180 by 160 feet.

"The west wing, or rather the main floor of the Pierce street front, is reserved exclusively for casting car wheels. The cupola which supplies the molten iron for this purpose is of the capacity of seventeen tons, and the full force are enabled to turn out sixty car wheels per day. This floor is supplied with four monster cranes which pick up the wheels from the flasks while still at a red heat, and passing them along from one to the other, convey them to the annealing room. Here are twelve immense pits of great depth and walled with brick, into which the wheels are lowered one by one to undergo the annealing process.

"Nearly the entire eastern floor is appropriated to general casting purposes, supplied with another cupola of the same dimensions and mammoth cranes for handling the ponderous castings produced. The southern wing contains the carpenter shop for the repair of patterns, flasks, etc., and the cleaning room, which is furnished with two immense "tumblers" to facilitate that operation.

"The engine room, in charge of Mr. Keyes, is a model of order and neatness. The machinery of this room was put up under the direct personal supervision of C. F. Jauriet, Esq., Superintendent of Machinery of the road, and Mr. Prindle, Master Mechanic, a sufficient guarantee that the nearest possible approach to perfection has been attained. The room contains a twenty-four horse power engine, built at Dayton, Ohio; the hoisting apparatus, by means of which all the iron and coal is elevated to the furnaces by steam, instead of the old system of tramways; and one of the celebrated Root blowers, which furnishes the blast for the cupolas, manufactured at Connersville, Ind., the most complete blower in the country, and requiring much less power than those of any other patent. So perfect is the working of every portion of the machinery in this room, that with one's eyes averted he will fail to detect the slightest noise or dream that a powerful engine, massive wheels and numerous pulleys are in full operation within a few feet of him. The engine is found to be insufficient for the immense amount of work required of it, and will soon be replaced by one more powerful."

Sandusky Bay Bridge.

A correspondent of the Oak Harbor *Exponent* furnishes that paper with the following in relation to the work of rebuilding the Sandusky bay bridge: "This bridge is being built across the Sandusky Bay by the Lake Shore & Michigan Southern Railroad Company. The width is about 21 feet and the length about two miles. There are 1,000 'bents,' eight feet apart. The 'swing,' over the channel is to be of iron, and will be 149 feet long. The piers at each end of the swing are 23 feet square. A 'bent' is composed of five piles driven in a row cross-wise of the bridge, fastened together by a 'cap' 12 inches square, mortised to the two outside piles and secured to the other three by three-quarter bolts driven through the cap into the top of the piles. The old bridge had three-inch caps for planks; so that, in this respect at least, the new bridge is an improvement. On the caps and bolted to them are four rows of 'stringers,' 12 inches square, running the whole length of the bridge. On the stringers and well spiked to them are the 'ties,' which of course lie the same way with the 'caps'—across the bridge. The ties are three by five inch plank and are laid so close together that they make a very passable walk for footmen. On these the iron is laid. The work is under the direct superintendence of Mr. O. J. True, a man well fitted for the position, and who, 18 years ago, filled the same position in the construction of the first bridge."

Leavenworth Bridge.

The first span of this bridge was completed on the 9th inst. Rapid progress is made in the construction at all points.

"Punch" on the Privileges of Railroad Employes.

A recent number of the London *Punch* touches off as follows the recent disclosures concerning the overworking of railroad employes on English lines:

"At a meeting of railway directors, which will probably be held in the middle of next week, it will be resolved, in order to increase the safety of the public, that no points-man, guard or engine-driver shall ever be on duty much more than six-and-forty hours at a stretch, and that every such servant shall always, when on duty, be allowed at least four minutes, no less than three times daily, for the enjoyment of his meals. With the like view of security it will also be resolved that porters shall on branch lines be required to act as pointsmen, signalmen and ticket clerks, and that due and timely notice of the changes in the time bills shall on no account be furnished to the drivers of goods trains."

Burned Car Shops.

The well-known car-shops of Gilbert, Bush & Co., on Green Island, near Albany, were partly destroyed by fire on the 17th inst. Several buildings were partially destroyed, and the total loss is estimated at $40,000, on which there is insurance amounting to $22,000. The loss is the greater because the buildings destroyed contained the motive power for the entire works, and some delay must occur in executing orders. The wood-finishing works were not injured.

A Great Rolling Mill in Connecticut.

Gov. J. Gregory Smith, President of the Vermont Central Railroad Company and also of the Northern Pacific, is reported to be urging the establishment of a great rolling mill for steel rails in New London, Conn., to employ 600 men, and to be ready to invest $300,000 of his own money and that of his friends in the enterprise. New London, being distant both from coal and iron, would seem hardly the place for such a mill.

American Engineering in Austria.

W. J. McAlpine, C. E., has just returned from Europe, after an absence of eight months. He has been commissioned by the Austrian government to superintend the removal of the rocks now obstructing the navigation of the Danube. He will return to Austria in May. His appointment is not only a compliment to Mr. McAlpine personally, but to the whole engineering profession of this country.

Dubuque & Dunleith Bridge.

The Keystone Bridge Company has been constructing for the Dubuque & Dunleith Bridge Company a series of bridges over what is called the "Slough" at Dubuque. The Dubuque *Herald* gives the following account of the bridges and of the tests made on the 13th inst. under the direction of J. E. Ainsworth, Engineer of Dubuque & Dunleith Bridge Company:

"The bridges consist of seven spans of ninety-six feet each, of the Linville & Piper patent truss, with leaning end posts, and the tests applied were two locomotives, Nos. 160 and 144 of the Illinois Central Railroad Company, with tenders fully loaded with coal and water, placed in succession upon each of the spans, making a stationary load of about one ton per lineal foot of bridge, with the following result—the spans being numbered from the east and the deflection noted in thousandths of an inch:

		DEFLECTION		
		E. qr.	Cen.	W. qr.
Span No. 1,	North truss	.444	.576	.444
	South "	.516	.562	.360
Span No. 2,	North "	.432	.552	.360
	South "	.492	.564	.504
Span No. 3,	North "	.360	.504	.444
	South "	.432	.504	.348
Span No. 4,	North "	.360	.456	.372
	South "	.480	.648	.432
Span No. 5,	North "	.384	.528	.372
	South "	.432	.528	.444
Span No. 6,	North "	.480	.528	.420
	South "	.396	.516	.456
Span No. 7,	North "	.384	.600	....
	South "	.468	.660	.478

"It was also found by observations taken under span No. 5, that under the load of one ton per lineal foot, moving at the rate of 15 miles per hour, the deflection of span was but 1.32 of an inch more than with the same load stationary thereon."

Joliet Iron and Steel Works.

Mr. P. Barnes, named in a notice of these works recently as "the engineer," wishes to correct the impression that may have been given by such a statement, that he is the chief and sole engineer, and informs us that Mr. A. L. Holley, the eminent engineer of New York, is consulting engineer of the Joliet Company, and that there are *two* resident engineers in charge of the construction of the new works, under Mr. Holley's directions, Mr. A. L. Rothman being one and Mr. Barnes the other.

Bochum Cast Steel Works.

Engineering gives the following facts from the report of the Bochum Mining and Cast Steel Manufacturing Company, whose agents in America are Hermann Boker & Co., of New York:

"The company has been employing this autumn 3,000 workmen in its cast-steel works and 400 men in its coal mines. In spite of the adverse influences of the late war, the value of the cast-steel production of the current fiscal year is estimated at 3,500,000 to 4,000,000 thalers. The company's wheel factory has been turning out 60 cast-steel wheels per day. Of cast-steel cannon, 150 breech-loaders ordered by the Turkish Government are now in course of construction. A cast-steel marine gun of 8in. bore has been experimented upon by the Prussian Ordnance Commission, and with a test of 500 rounds has given very satisfactory results."

English Sleeping Car.

We cut the following description of "railway sleeping accommodation" from *Engineering:*

"There has lately been exhibited at the Caledonian Railway Station a new form of sleeping carriage, which has been invented by Mr. James Howlinson. It is remarkably well adapted for night traveling. Externally the carriage is exactly the same as those in ordinary use; its length is 33 feet, or about 2 feet longer than the common carriage. Internally the compartments, while in use during the day, do not differ in any respect from others; but when night comes on, the arm-rests in the first-class compartments are raised, and thus two beds are provided, while above what seems the partition of the carriage is lowered on each side, and other two passengers are accommodated for the night. These upper berths, which are provided with pillows, resemble somewhat the "bunks" in use at sea. They are supported on brass rests fitted into the sides of the compartment, and are further secured by chain straps depending from the roof, by way of giving a feeling of additional security to sleepers. The carriage in question has been in use during the past month between London and Cambridge, and is now in Glasgow for the inspection of local gentlemen."

They better send for Pullman.

Planing Cast Iron.

"To plane a piece of cast iron perfectly true on a true plane is a job not often accomplished by the best workmen," says an "English Engineer in America," writing to *Engineering*, "and for two reasons—first, the casting is liable to be sprung in securing to the plane-bed, and in the usual way no hand is so delicate as to avoid it altogether. Secondly, removing the scale from one side, by relieving the strain, gives it a tendency to warp, so that

when the casting is loosened up it is out of true. These facts are well understood and partially avoided by "shimming" up the work directly under the straps as carefully as possible to neutralize the first trouble, and loosening up the straps to the lowest tension so as to confine the work the least possible for the second. These are at the best but modified remedies; but resting the work, of whatever shape or character, on three points or bearing places, and securing it by three clamps directly over the bearing points, overcomes both difficulties perfectly. This principle is subject to so broad an application that I can hardly conceive of a shape of any material, unless it be too delicate to withstand the pressure of the cut, for which this triangular support is not the correct one, even if the casting is of such a size as to appear to be beyond the possibility of springing—very few planer beds are, and it is as bad to spring one as the other. The three-support system will spring neither. Apply the same principle to securing work to the face-plate of a lathe. Take, for example, a six-arm pulley, block out the face-plate by using only three packing pieces under the alternate arms, and secure it by three straps directly over the packing pieces; it may then be bored, faced, and at least rough turned, if not finished, without the least fear of its changing form when taken off. In answer to the question, 'Supposing the pulley had but four arms?' even then it is best to use but three supports, leaving the fourth arm free."

British Rail Exports for December and the Year 1871.

Heyerdahl, Schönberg & Co., of No. 31 Pine street, New York, give the following report of exports of rails from Great Britain, extracted from government returns:

To	Month ending 31st of December.			12 Months ending 31st of December.		
	1869. Tons.	1870. Tons.	1871. Tons.	1869. Tons.	1870. Tons.	1871. Tons.
United States	22,681	50,60)	37,372	299,196	421,824	511,059
Russia	1,723	346	894	246,162	207,676	79,119
Austrian Territ'es	1,319	11	16	27,09)	38,434	21,189
British India	11,740	6,716	1,219	99,224	153,127	34,707
British N. Amer.	.....	849	216	23,772	36,291	61,733
Egypt	.....	62	2,400	6,276	2,333	14,784
Australia	1,568	628	964	23,329	8,691	14,110
Brazil	371	1,095	1,124	3,911	5,890	20,528
Holland	706	370	225	12,184	15,466	14,811
Spain & Canaries	999	1,214	1,173	13,473	13,195	13,318
Sweden	.....	254	801	5,225	2,933	9,170
Chili	1,948	1,438	98	4,823	17,273	11,262
Spanish W. I. Isl's	.....	500	143	1,376	3,709	3,512
Peru	722	163	2,337	21,841	13,843	28,949
France	143	.....	6	4,461	372	2,654
Germany	3,573	2,647	648	30,354	52,660	50,388
Other countries	3,451	8,270	9,461	65,299	65,665	85,184
Total	50,944	75,174	59,127	888,010	1,059,392	979,017
Total exports of iron and steel	184,003	192,199	204,258	2,680,723	2,825,575	3,171,581

Thus it appears that of the total iron and steel product exported from Great Britain during the year 1871, more than 30 per cent. was rails, and that of the total rail exports more than one-half (52 per cent.) was to the United States. This was sufficient to lay 5,800 miles of railroad with iron weighing 56 lbs per yard.

Setting Eccentrics.

A correspondent of the *English Mechanic* communicates to that paper the following directions for setting eccentrics:

"In setting eccentrics the first thing to be determined is the length of the eccentric rod. The slide case being removed, the length of the eccentric rod may very nearly be found by placing the slide valve in the middle of the cylinder face, so that the steam ports shall be equally covered. Then fix the eccentric in any position on the fly-wheel shaft, turn the shaft round till the wide side of the eccentric is at its highest point, and measure from the center of the pin in the slide-rod joint to the bottom of the socket in the eccentric band, which is the length of the rod. It is best to cut the rod a little longer than the measurement, as it can always be shortened, and its length can only be extended within narrow limits. The socket end of the rod must have a screw formed on it to fit the eccentric band, and the rod may be adjusted to its true length by screwing in or out of the socket. Having fixed the eccentric rod, turn the shaft round until the wide part of the eccentric is at its furthest point from the cylind r, and notice how much the steam port for the bottom of the cylinder is opened; then turn the shaft again until the wide part of the eccentric is at its nearest point toward the cylinder, and notice how much the steam port for the top of the cylinder is opened. If the steam port for the top of the cylinder be opened wider than that for the lower, the rod is too long, and must be shortened half the difference that one port is wider than the other. If the bottom port is opened further than the top, the rod must be lengthened half the difference, which may be done by unscrewing it further out of the socket. The length of the rod is correct when both steam ports are equally uncovered. The next thing to do is to fix the eccentric on the shaft so that the steam shall be admitted into the cylinder at the proper intervals. To do this turn the shaft round till the piston is at the bottom of the cylinder, then turn the eccentric round on the shaft until the port for the bottom of the cylinder is open wide enough to admit a piece of writing paper. The eccentric may now be fixed in its place by means of a key. Now turn the shaft round until the piston is at the top of the cylinder, and if there is the same amount of opening at the top as there was at the bottom, the valve is properly set. It is of great importance to the working of the engine that this amount of opening is obtained before the piston commences its stroke."

Dust from Dry Grinding.

"The Societé d'Encouragement of Paris having offered a prize for an invention to protect the cutters of millstones from the dust produced in the process, which produces distressing diseases of the lungs, M. Catelliers and a commission have been making a series of experiments on the effects of ventilation, and the most satisfactory results are said to have been obtained. By means of a fire and a tall chimney, a current is produced in the dressing-shop, having a rate of ten feet per second, from the men, and it is found that by this simple method all the dust is removed. There are many trades in this country requiring the application of this system."

If the above statement, which we copy from a foreign journal, is correct, we infer that by simply connecting a pipe with an ordinary smoke-stack, sufficient current would be produced to carry off the dust from an emery wheel or dry grindstone. It is worth a trial at any rate.

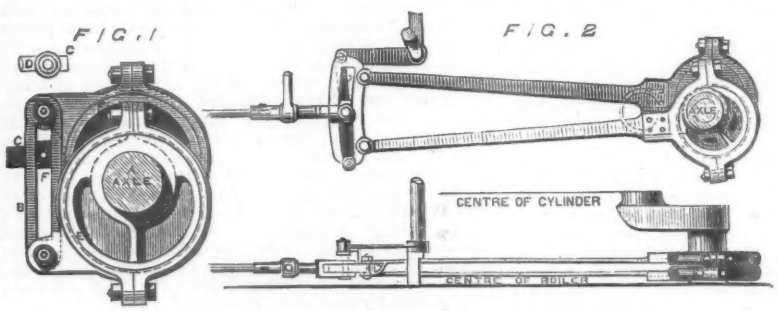
Broad or Narrow Gauge in India.

It is reported that, after a protracted controversy as to whether the new railways in India should be constructed on the broad (5ft. 6in.) or the narrow (3ft. 3in.) gauge, the decision in favor of the latter has been set aside, and a still further delay is likely to take place in carrying out the necessary works.

The Invention of Link Motion.

A correspondent of the *English Mechanic* writes as follows in reply to an inquiry as to the inventor of link motion:

The inventor of the link motion in its simplest, original and best form was Mr. William Howe, who introduced it in August, 1842, while he was a workman in the employ of R. Stephenson & Co., engineers, Newcastle-on-Tyne. Just before that date, Mr. Williams, a young gentleman apprentice at the same works, suggested a plan shown, fig. 1; but nothing more was ever done with it. Fig. 2 is a plan and elevation of Howe's link motion, which, as it will be readily seen, is, and has been proved to be, the best ever invented. Mr. Howe made a pencil sketch and a rough wooden model of his link motion, both of which can be seen at the South Kensington Museum. This model so perfectly indicated what the link motion should be that he showed it to the manager of Messrs. Stephenson's works, who at once saw its worth, not only as a reversing, but also as an expansive gear for working the slide-valve, and sent the model at once to Mr. Robert Stephenson, then in London, who also approved of it immediately. At that time (August, 1842)



two locomotives were being built at Stephenson's works for the North-Midland Railway Company, now a portion of the Midland. These engines were to have been fitted with the old "wedge motion." Their numbers were 358 and 359 in Messrs. Stephenson's books, but Nos. 70 and 71 in the North-Midland's. One of them (No. 70) was already fitted with the "wedge motion:" but as soon as Mr. Howe brought out the "link motion" it was fitted to No. 71 instead of the "wedge motion." Mr. Howe was at that time making a working model of the "wedge motion," but as soon as he invented the "link motion" he was instructed to throw the other aside, and make a full-sized model of his kind. This model included the sections of the cylinder, piston and slide-valve, and the points of "cut-off" for each stroke of the piston were plainly seen.

TABULAR STATEMENT OF VALVE GEAR OF ENGINE NO. 71, CONSTRUCTED 1842.

Number of Notch from Centre of Rack	Travel of Valve	Steam Port Open	Supply Lead	Lap of Valve—Outside	Lap of Valve—Inside	Cut off at Stroke of Piston	Exhaust Port Open	Exhaustion Lead	Ratio of Expansion	Ratio of Exhaustion
	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.
1	1¼	″	″	″	☆	4½	11¼	☆	7½	8¼
2	1½	″	″	″	☆	7½	14	☆	6½	6
3	1¾	″	″	″	☆	10½	1 4	☆	5½	4½
4	2	″	″	″	☆	13	17½	☆	4½	2½
5	2¼	″	″	″	☆	14½	18½	☆	3½	1½
6	2½	″	″	″	☆	16½	18½	☆	2½	1¼
7	2¾	″	″	″	☆	17½	19½	☆	2	″

No. 71, the first engine fitted with "link motion," commenced running September 10, 1842. Mr. R. Stephenson adopted the "link motion," acknowledged W. Howe as its inventor, and made him a present of twenty guineas for his invention, and in 1846 appointed him engineer of the Stephenson collieries and iron works at Clay-Cross, Chesterfield, where (in 1847) Mr. Howe applied the "link motion" to the pumping and winding-engines with great success.

The Governor of Iowa on Railroads.

Governor Samuel Merrill, in his message to the Iowa Legislature (his last), has the following concerning the growth of railroads in that State, the proper supervision of them by State officers, and their equitable taxation:

I have before mentioned the completion of the entire line of railroad from Dubuque to Sioux City, and of its Tete des Morts branch, as well as the construction of the McGregor & Missouri River Railway to Algona, and of the Des Moines Valley road to Fort Dodge. In addition to these land-grant roads, the Burlington, Cedar Rapids & Minnesota Railroad is now in operation from Burlington to Nora Springs, in Floyd County; the Central Railroad to Northwood, Worth County. The St. Louis & Cedar Rapids Railroad is completed to Ottumwa, and is operated by the North Missouri Railroad Company, making a direct route from that city to St. Louis. The Burlington & Southwestern Company has built a line from Fort Madison to Bloomfield, connecting at the former place with Burlington and at the latter with Moulton. The Chicago, Rock Island & Pacific Company has extended its road from Washington through the counties of Jefferson, Wapello, Appanoose and Wayne into the State of Missouri, and through that State to Leavenworth, Kansas. The Burlington & Missouri River Railroad Company has built a branch from Red Oak Junction, in Montgomery County, to Hamburg, in Fremont County, a distance of thirty-nine miles. The Davenport & St. Paul Railroad has built from the first-named city to Maquoketa, in Jackson County, a distance of forty-three miles, and to Wyoming, in Jones County, a distance of fifty-three miles. The Iowa Midland Railroad is in operation from Clinton *via* Maquoketa to Anamosa, and the Sabula, Ackley & Dakota Railroad is built from the former place through Jackson and Clinton Counties to Oxford Mills, in Jones County, a distance of some fifty miles.

On the 31st of December, 1868, there were 1,448 miles of railroad in the State, and on the 31st of December, 1870, there were 2,783 miles of railroad in operation in the State. According to the estimate of the Treasurer of the State, the value of the property now in railroads may be put at rather more than $80,000,000, or about one-eleventh of the entire value of all the property in the State. The magnitude of this interest is now so formidable as in my opinion to demand some measure of official supervision. At present, railroad companies, upon the completion of their lines, are required to report to the Legislature, stating "the amount paid in," the entire expenses of construction, "the length of the road, the number of planes on it, with their inclination to the mile, the greatest curvature of the road, the average width of the grade and the number of ties per mile." I am not aware that any railroad company in the State has complied with this requirement; certainly very few, if any, have done so.

Each railroad is also required to report, under oath, to the Secretary of State annually, "showing the amount" of its capital stock, and "amount paid thereon; the amount of bonds issued and how secured, and all other indebtedness; the length of such railroad when completed, and how much is built and in use; the number of acres of land donated or granted to them, by whom, and what disposition has been made of said grants or donations; the gross amount of receipts, and how disbursed; the net amount of profits and the dividends made, with such other facts as may be necessary to a full statement of the affairs and condition of such railroads." This requirement is complied with by only a small number of companies, and it is not made the duty of any officer to enforce the provisions of either statute. The latter may be compelled by a writ of mandamus asked for by any stockholder, but there is no penalty in either case for failure to make report. If it were made the duty of some public officer to enforce the making of these reports, there can be little doubt that they would be obtained. Other States, with a larger experience than ours, yet with interests no greater, require systematic reports for the information of the people and to aid in intelligent legislation. There are also questions of safety for life and property, in the management and repairs of old roads and in the construction of new ones, that suggest the need of official supervision. I would recommend the appointment of a board of commissioners, clothed with authority to inspect the several railroads in the State, their mode of construction, management, mode of operating, charges, connections, etc., and with power to compel an observance of the laws of the State concerning railroads.

I have before made suggestions as to the disposition to be made of railroad taxes. The question as to the mode of raising these taxes has been much discussed, and that now prevalent in this State has been more or less severely criticised. I am, however, of the opinion that it is the most practicable method yet devised for the purpose. But, in order that this sort of property should bear its just proportion of the public burdens, it is only proper that the tax now levied upon gross earnings should be increased. The entire sum collected from railroads for the year 1870 amounts to $186,722 04. The property paying this tax is estimated by the Treasurer of State as worth $75,000,000. To correspond with the assessment of other property, it would probably be valued for revenue purposes at some $30,000,000. The tax obtained from railroads, therefore, is equal to about six and a quarter mills on what, under the estimate adopted, would be the assessed value of this kind of property. I have elsewhere given the average tax throughout the State for the same year at 3½ per cent., or about five times that contributed by railroad property. It may be said that this calculation is based upon an overvaluation of the property of railroads. Perhaps it is; yet it certainly cannot be so far out of the way as to obliterate the fact that a very great disparity exists between the revenue from this class of property and that from other sources. This state of affairs, I submit, can readily be remedied without imposing any undue burdens upon existing lines, or crippling new enterprises.